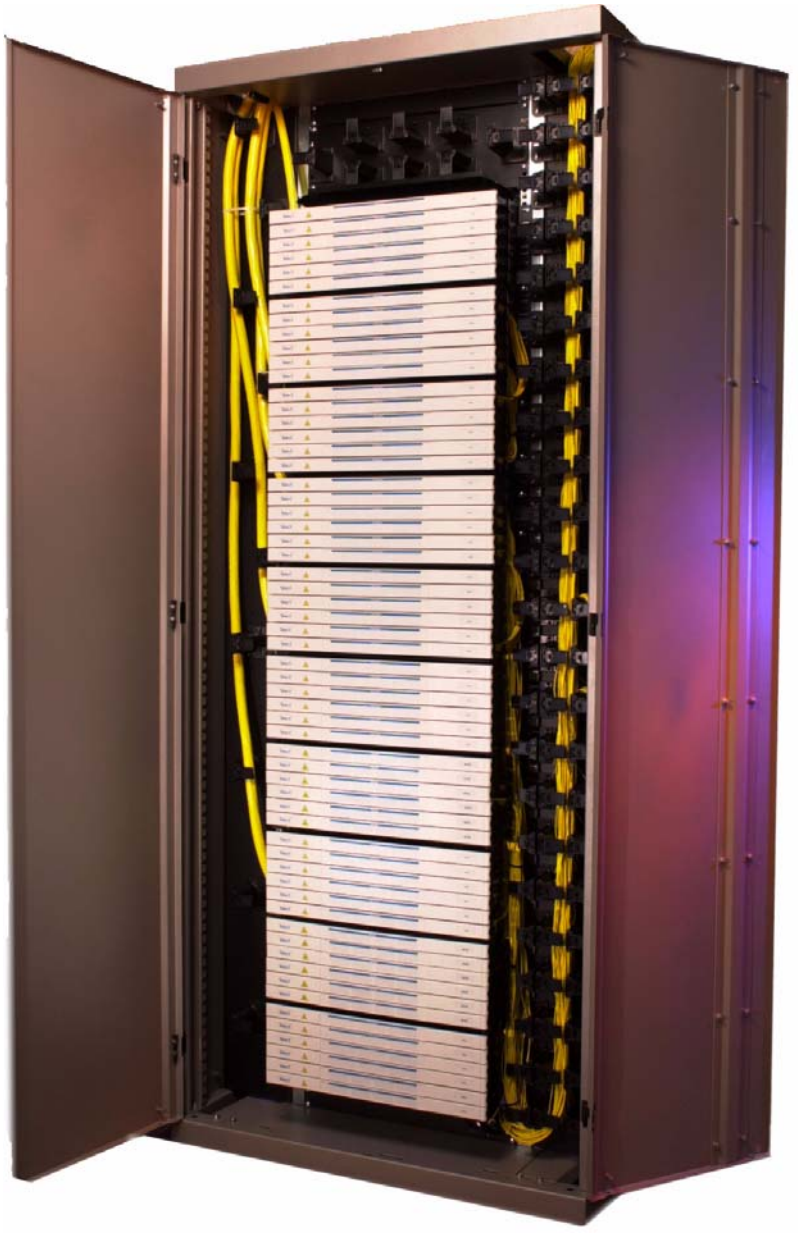
E-Series Optical Splice Patch Storage Tray-Based System

User Manual



Telect®
CONNECTING THE FUTURE®

E-Series Optical Splice Patch Storage Tray-Based System

User Manual, Part Number 136328-2

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About Telect

Telect offers complete solutions for physical layer connectivity, power, equipment housing and other network infrastructure equipment. From outside plant and central office to inside the home, Telect draws on more than 25 years of experience to deliver leading edge product and service solutions. Telect is committed to providing superior customer service and is capable of meeting the dynamic demands of customer and industry requirements. This commitment to customer and industry excellence has positioned Telect as a leading connectivity and power solution provider for the global communications industry.

Technical Support

E-mail: getinfo@telect.com

Phone: 888.821.4856 or 509.921.6161

E-Series Optical Splice Patch Storage

User Manual

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Chapter 1: Description

1.1 Overview

Figure 1 - ESTF-06TR-4RU

E-Series is an advanced, fiber-optic cable management system. The E-Series provides a central location for fiber patching, splicing, and storage.

Telect engineered the E-Series for central office (CO), customer premises, or for any ETSI application where rear access to equipment is limited or impractical. Cable management includes articulated links that allow slide-out access to patch adapters mounted on pull-up carriers in addition to slide-out access to splice cassettes. You can order trays with pull-up adapters to accommodate 12 or 24 sets of FC, ST, SC, LC, or E2000 fiber connectors.Trays are available with or without preterminated feeder or connectorized pigtails.

1.2 Main Assemblies

- A chassis (rack shelf) assembly
- Any assortment of patch, splice, combination splice/patch, and storage trays that slide into the chassis assemblies
- Routing and protection hardware for incoming and outgoing fiber cable
- Industry-standard, multi-fiber cable assemblies and pigtail bundles

Figure 2 - E-Series 1RU Chassis (ESTF-01TR-1RU) With a Splice/Patch Tray

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1.3 Chassis Assemblies

E-Series chassis fit standard 485-mm (19-in.) ETSI racks. Each chassis holds up to six trays:

- 1 RU, 1-Tray Chassis (Model ESTF-01TR-1RU)
- 2 RU, 3-Tray Chassis (Model ESTF-03TR-2RU)
- 3 RU, 4-Tray Chassis (Model ESTF-04TR-3RU)
- 4 RU, 6-Tray Chassis (Model ESTF-06TR-4RU)

Figure 3 - Model ESTF-06TR-4RU Chassis

Each chassis is black with built-in front entry/exit arcs and tray slide receivers. M6 rack mounting screws are included. Standard chassis are available in black.

1.4 Trays

Telect offers an assortment of trays for patching, splicing, and storage. All tray are black steel with black cable routing arcs and guides. All trays are front corner cable entry and exit through Telect's patented, articulated link system along right and left sides of the trays, forming channels that maintain critical bend-radius control when trays are extended and retracted.

From the factory, each tray is configured for either 12 or 24 circuits. The following table outlines the number of possible terminations for each of the four chassis assemblies. Mixing 12 and 24 circuit trays in a single chassis accounts for any standard IFC and OSP cable capacity. Telect also offers adapter and splice cassette kits to boost the capacity of 12-circuit patch and splice trays up to 24 circuits.

Chassis Assemblies	12 Terminations per tray, up to	24 Terminations per tray, up to
ESTF-01TR-1RU	12 Circuits Per Chassis	24 Circuits Per Chassis
ESTF-03TR-2RU	36 Circuits Per Chassis	72 Circuits Per Chassis
ESTF-04TR-3RU	48 Circuits Per Chassis	96 Circuits Per Chassis
ESTF-06TR-4RU	72 Circuits Per Chassis	144 Circuits Per Chassis

In a loaded rack or optical distribution cabinet, such as shown on the cover, a single bay or cabinet can hold as many as 1440 terminations (10 chassis x 6 trays per chassis x 24 terminations per tray).

The following paragraphs detail some of the forms and features of each Telect E-Series Tray:

- "1.4.1 Patch Trays" on page 3
- "1.4.2 Splice Trays" on page 7

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- “1.4.3 Combination Splice and Patch Trays” on page 10
- “1.4.4 Storage Tray” on page 14

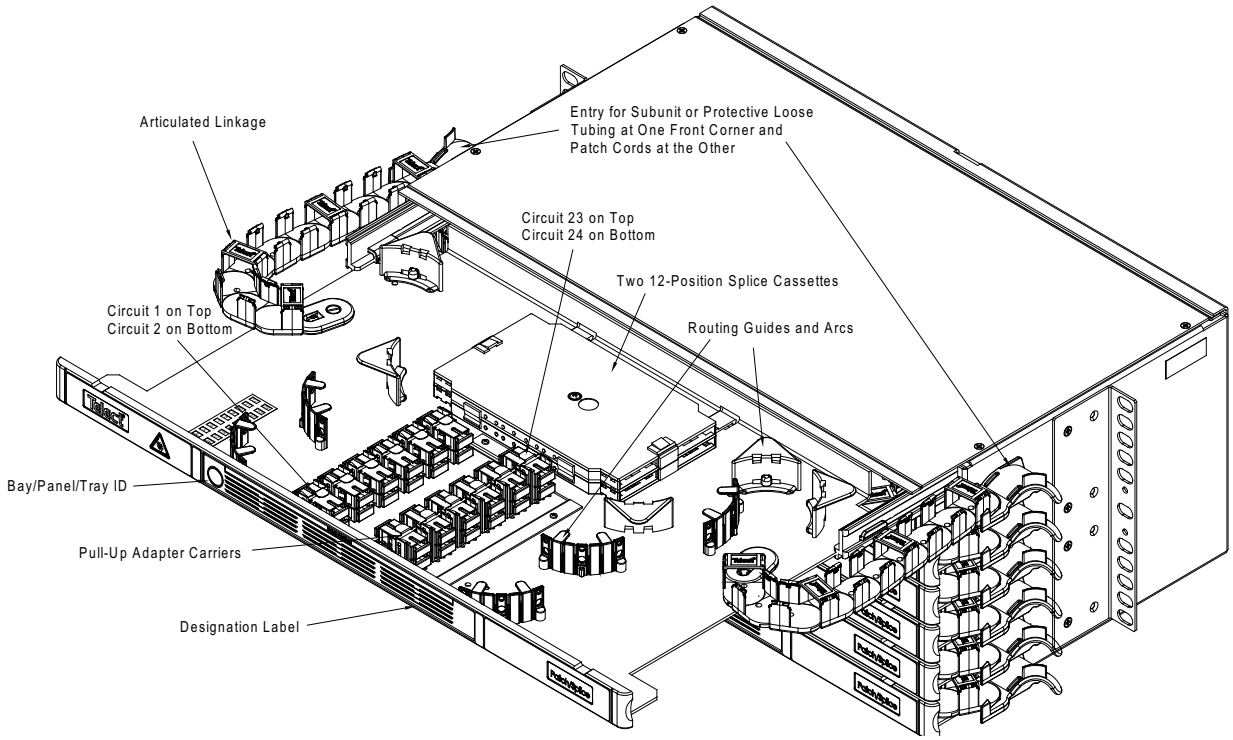
Articulated Linkage
Entry for Subunit or Protective Loose Tubing at One Front Corner and Patch Cords at the Other
Circuit 23 on Top
Circuit 24 on Bottom
Two 12-Position Splice Cassettes
Circuit 1 on Top
Circuit 2 on Bottom
Routing Guides and Arcs
Bay/Panel/Tray ID
Pull-Up Adapter Carriers
Designation Label

Figure 4 - Tray Components

1.4.1 Patch Trays

From the factory, E-Series Patch Trays have either 12 or 24 adapters. Trays are available with all of the standard choices of adapters and polishes.

Use E-Series Patch Trays for cross-connect patching, interconnections between IFC and network element, and interconnections between network elements.

Figure 5 - Model ESTF-P024-USC-000 Patch Tray

Figure 6 - Model ESTF-P012-UFC-000 Patch Tray

Figure 7 - Model ESTF-P012-ULC-000 Patch Tray

The 6 or 12 pull-up carriers per tray support 2 over-and-under adapters each. Patch trays include on-board retermination storage (about .5 m) for each subunit or loose tube. Also, patch trays come with cable and connector management hardware, tray slides, and a designation strip.

The following table lists standard Telect E-Series Patch Trays. The “000” at the end of a model number designates that a particular tray does not includes factory-installed cable. But factory-installed, connectorized IFC is available up to “999” meters, for example, ESTF-P012-USC-500.

Table 1 - Standard Telect E-Series Patch Trays

Patch Tray	Ports (Terminations)	Adapters & Polishs
ESTF-P012-USC-000	12	SC/UPC
ESTF-P012-ASC-000	12	SC/APC
ESTF-P012-ULC-000	6	LC/UPC
ESTF-P012-ALC-000	6	LC/APC
ESTF-P012-UE2-000	12	E2000/UPC
ESTF-P012-AE2-000	12	E2000/APC
ESTF-P012-UFC-000	12	FC/UPC
ESTF-P024-USC-000	24	SC/UPC
ESTF-P024-ASC-000	24	SC/APC
ESTF-P024-ULC-000	12	LC/UPC
ESTF-P024-ALC-000	12	LC/APC
ESTF-P024-UE2-000	24	E2000/UPC
ESTF-P024-AE2-000	24	E2000/APC
ESTF-P024-UFC-000	24	FC/UPC

The following illustrations show typical routing schemes.

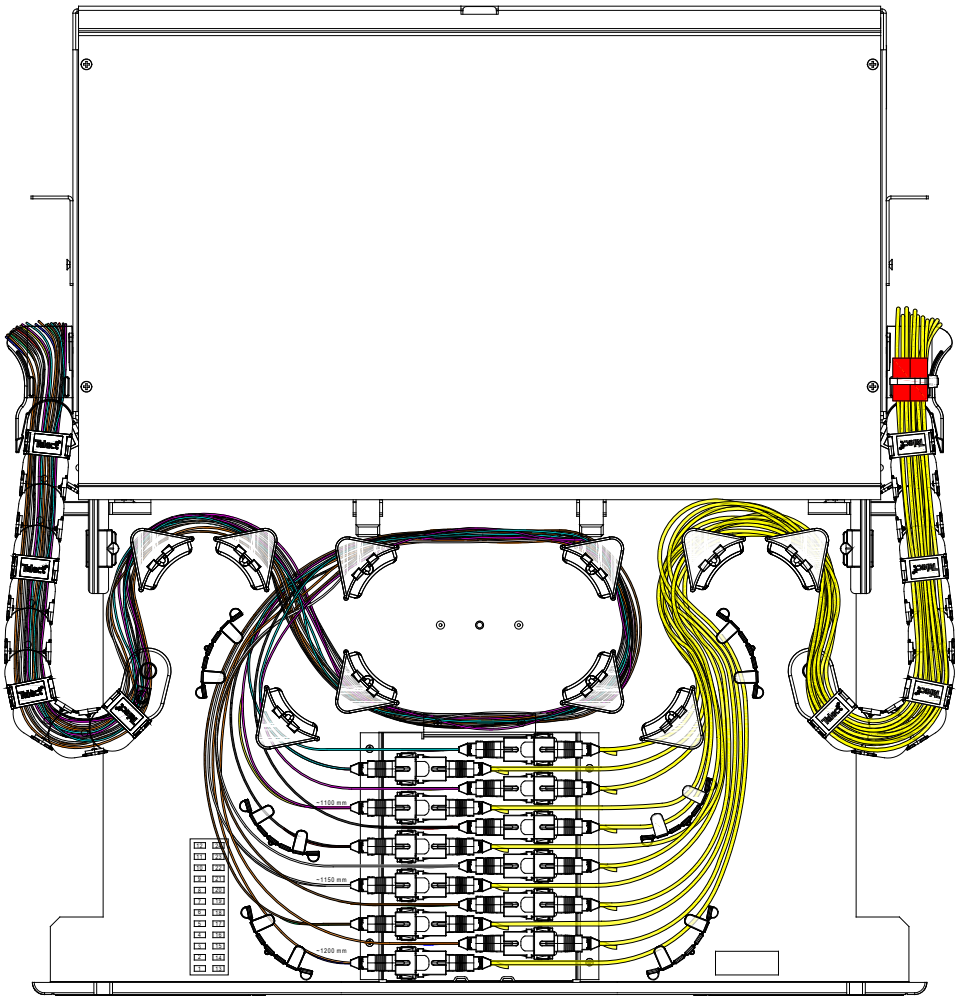

Figure 8 - ESTF-P024-USC-000 With IFC Multi-Fiber on the Left & Jumpers (or Patch Cords) on the Right

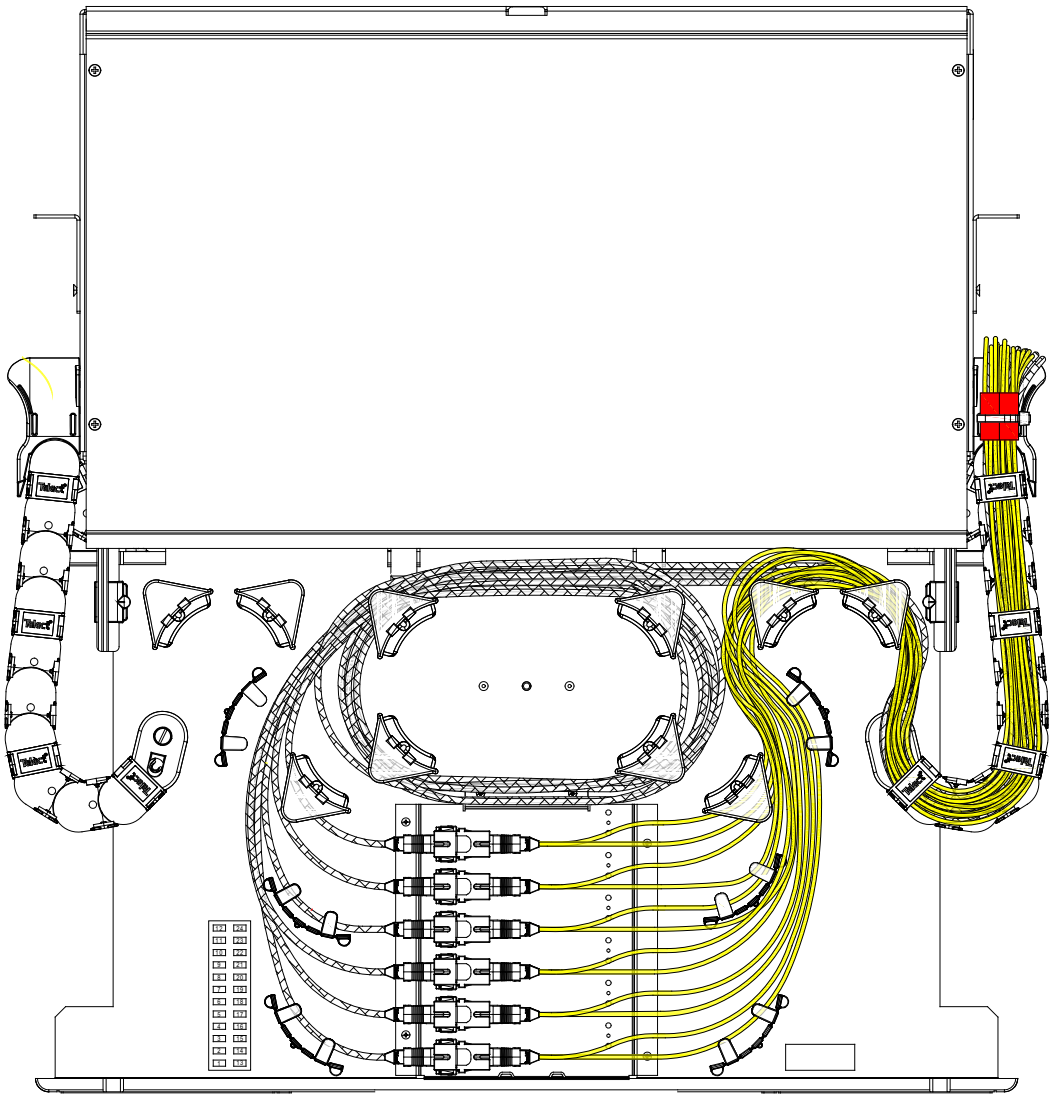

Figure 9 - ESTF-P012-USC-000 With Same-Side Entry of Jumpers and OSP Fiber (in Protective Tubing) on the Right

1.4.2 Splice Trays

E-Series Splice Trays have either one or two, 12-place splice cassettes. ESTR-S012-000-000 (one cassette) accommodates 12, and ESTR-S024-000-000 (two cassettes) accommodates 24 heat-shrink fusion splices. Trays provide on-board retermination storage (about .5 m) for each subunit or loose tube, and cassettes provide about 1 m of retermination storage for each fiber strand.

Splice trays include storage arcs, cable and connector management hardware, tray slides, and a designation strip.

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The “000-000” at the end of splice model numbers designates that the splice trays include neither adapters nor factory-installed fiber.

Figure 10 - Model ESTR-S024-000-000 Splice Tray

Figure 11 - Model ESTR-S012-000-000 Splice Tray

The following illustrations show typical routing schemes.

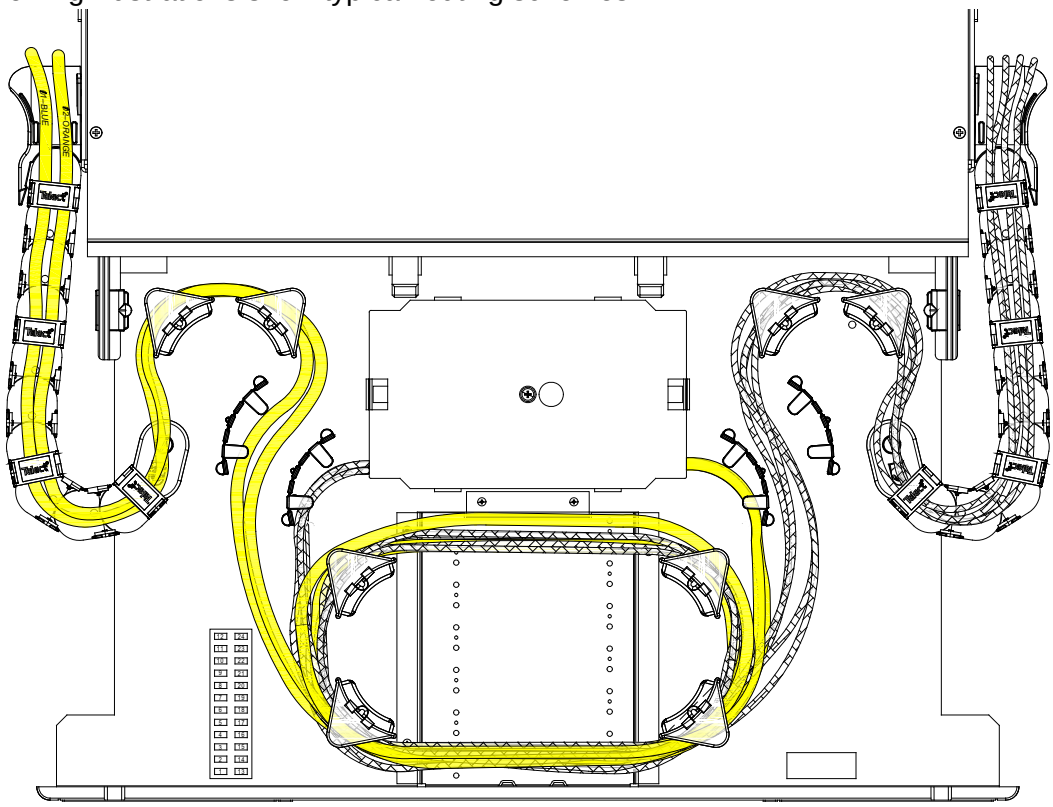

Figure 12 - ESTF-S024-000-000 With IFC Multi-Fiber Subunits on the Left & OSP Multi-Fiber in Protective Tubing on the Right

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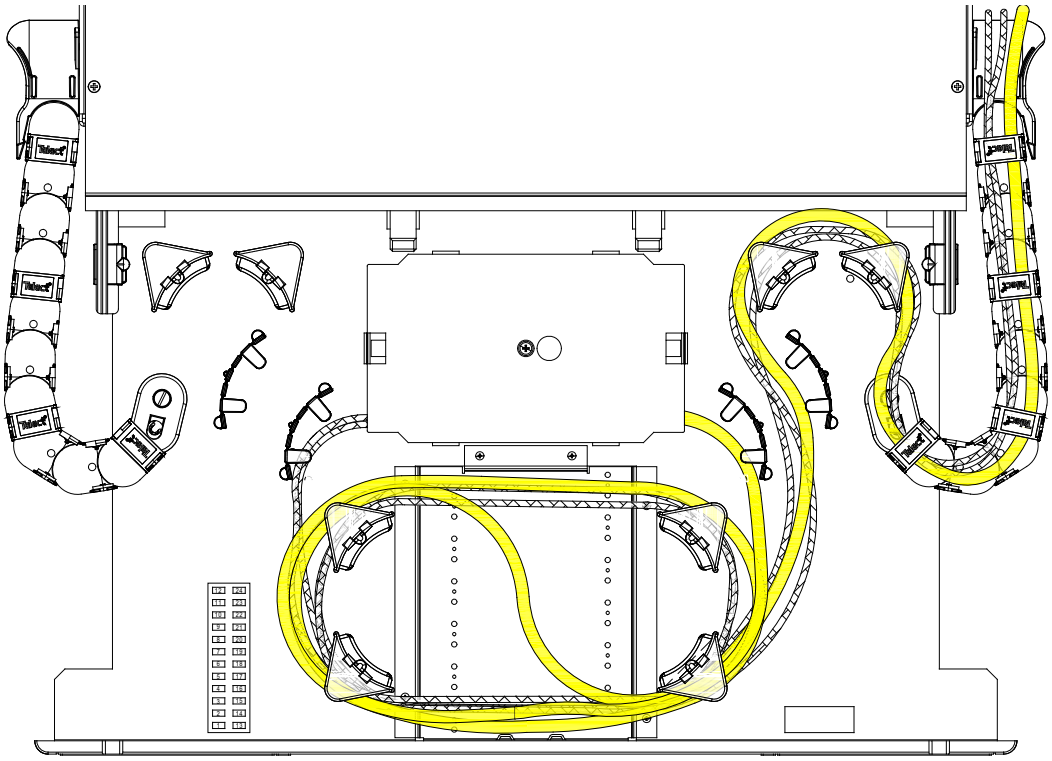

Figure 13 - ESTF-S012-000-000 With Same-Side Fiber Entry on the Right

1.4.3 Combination Splice and Patch Trays

From the factory, E-Series Combination Splice/Patch Trays have either 12 or 24 adapters with one or two 12-place splice cassettes to match. Trays are available with all of the standard choices of adapters and polishes — same as the patch trays.

Figure 14 - Model ESTF-C012-USC-000 Splice/Patch Tray

Figure 15 - Model ESTF-C024-UFC-000 Splice/Patch Tray

Figure 16 - Model ESTF-C024-ULC-000 Splice/Patch Tray

Like the patch trays, each pull-up carrier supports two over-and-under adapters. Splice/patch trays include cable and connector management hardware, tray slides, and a designation strip.

The trays can be ordered with or without connectorized pigtails.

The following table lists all standard Telect E-Series Splice/Patch Trays. In the table, a blank or "0 0 0" at the end of a model numbers designates that a particular splice/patch tray does not include factory-installed connectorized pigtails. "L D D" at the end signifies factory-installed, connectorized 2-m pigtails routed from the cassette's splice holders to the adapters.

The illustration that follows shows the typical routing scheme.

Splice/Patch Tray[a]	Terminations	Adapters & Polish
ESTF-C012-USC-_ _ _	12	SC/UPC
ESTF-C012-ASC-_ _ _	12	SC/APC
ESTF-C012-ULC-_ _ _	6	LC/UPC
ESTF-C012-ALC-_ _ _	6	LC/APC
ESTF-C012-UE2-_ _ _	12	E2000/UPC
ESTF-C012-AE2-_ _ _	12	E2000/APC
ESTF-C012-UFC-_ _ _	12	FC/UPC
ESTF-C012-UST-_ _ _	12	ST/UPC
ESTF-C024-USC-_ _ _	24	SC/UPC
ESTF-C024-ASC-_ _ _	24	SC/APC
ESTF-C024-ULC-_ _ _	12	LC/UPC
ESTF-C024-ALC-_ _ _	12	LC/APC
ESTF-C024-UE2-_ _ _	24	E2000/UPC
ESTF-C024-AE2-_ _ _	24	E2000/APC
ESTF-C024-UFC-_ _ _	24	FC/UPC
ESTF-C024-UST-_ _ _	24	ST/UPC

a. Blank or 0 0 0 for ordering trays without factory-installed pigtails or 0 0 2 for factory-installed, connectorized pigtails

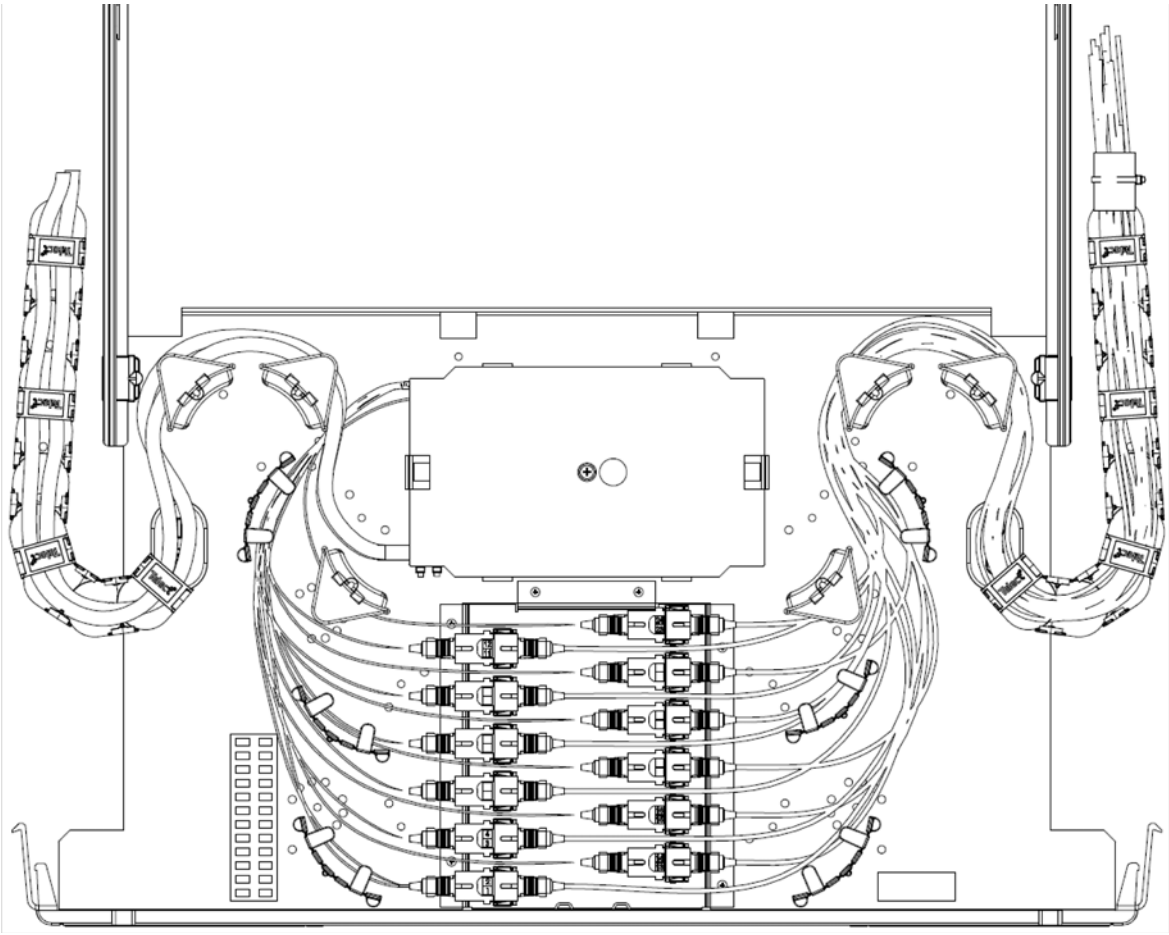

Figure 17 - ESTF-C024-USC-000 With IFC Multi-Fiber Subunits on the Left & Jumpers (or Patch Cords) on the Right

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1.4.4 Storage Tray

The E-Series Storage Tray (Model ESTR) stores jumper or patch cord slack. Single pass-through storage can vary in lengths from less than 1 m up to nearly 3 m. Maximum number of jumpers or patch cords depends on their diameter versus the capacity of the articulated linkage.

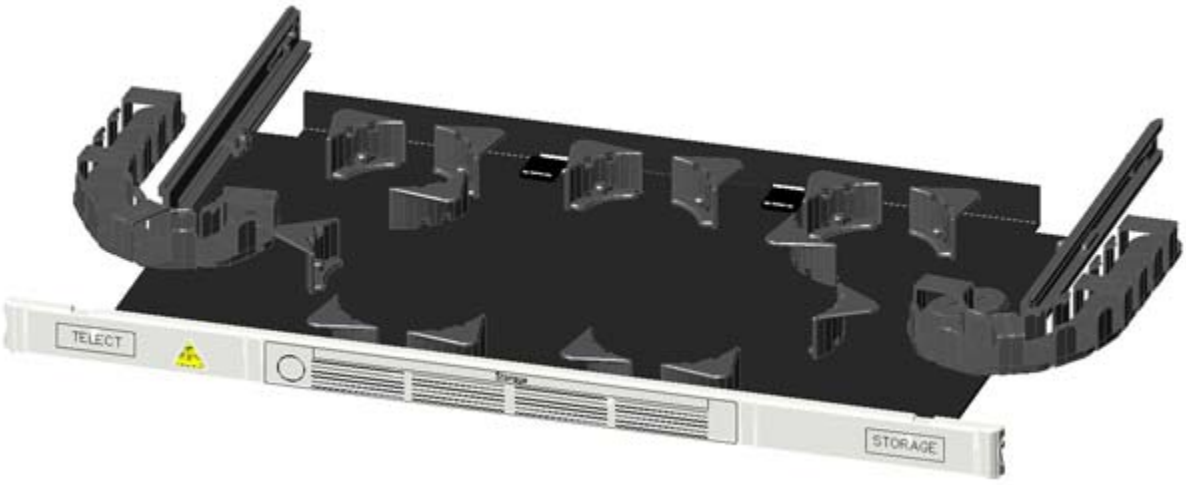

Figure 18 - Model ESTR Storage Tray

The following cabling capacities assume very dense packing. Use this list for comparison purposes only; avoid over-packing.

- ~90 cables (1.75 mm dia.)
- ~64 cables (2 mm dia.)
- ~32 cables (3 mm dia.)

The following illustrations show typical routing schemes. Other schemes are possible. Trays can accommodate combinations of routing schemes. Jumpers and patch cords can enter/exit at opposite corners or at the same-side corner.

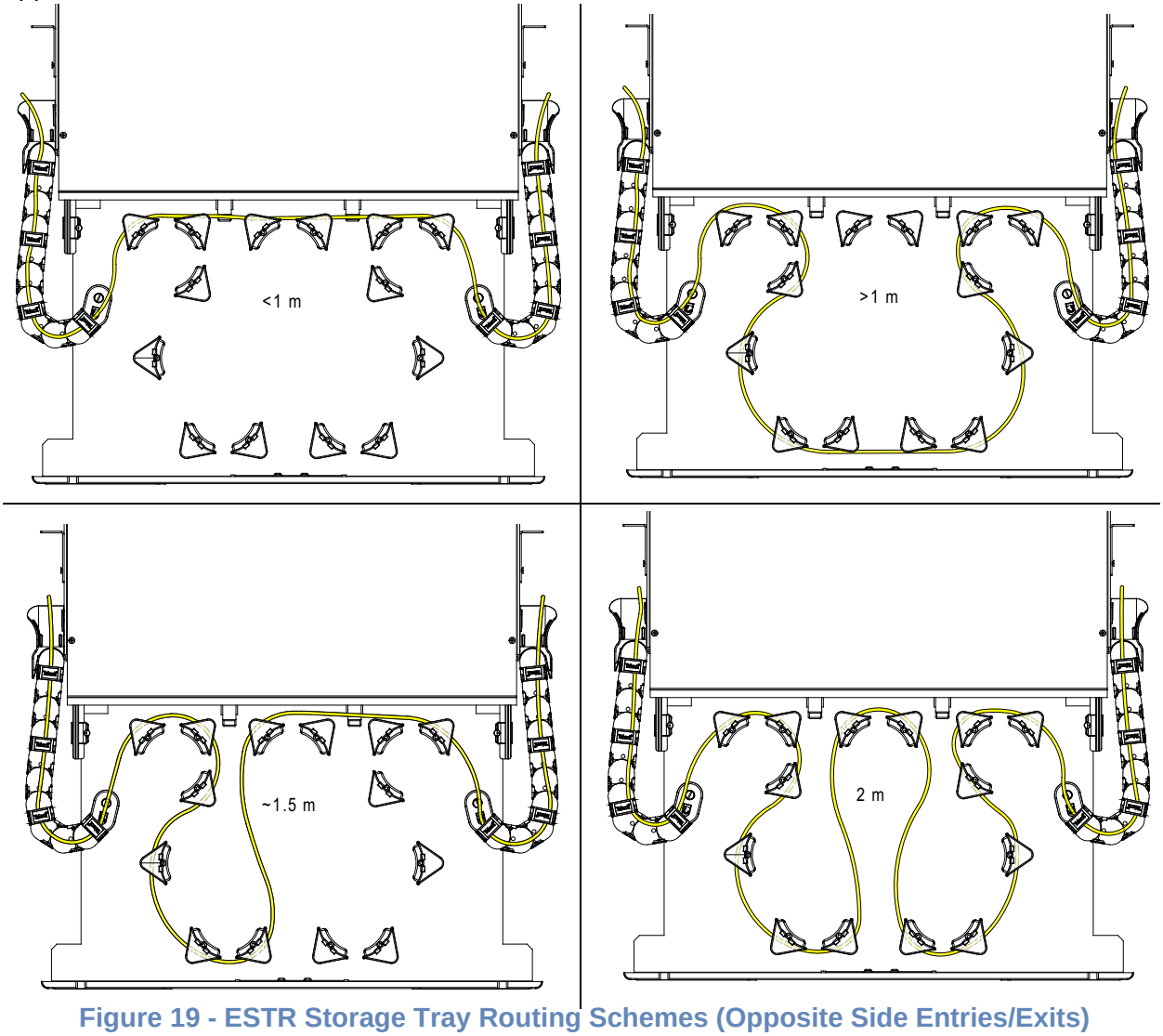

Figure 19 - ESTR Storage Tray Routing Schemes (Opposite Side Entries/Exits)

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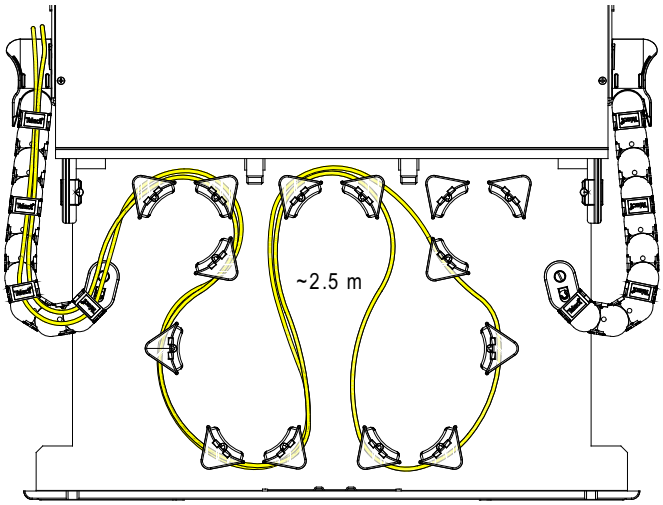

Figure 20 - ESTR Storage Tray Routing Schemes (Same-Side Entries/Exits)

1.5 Specifications

1.5.1 Physical

- **Dimensions**: See the following illustration for access and fit.
- **Chassis Weight (without trays)**:

Chassis Assemblies	Weight (kg)	Weight (lb)
ESTF-01TR-1RU	1.2	2.6
ESTF-03TR-2RU	1.6	3.4
ESTF-04TR-3RU	1.9	4.2
ESTF-06TR-4RU	2.2	4.9

- **Tray Weight** (without cabling): ~1.0 kg to ~1.3 kg (2.2 lb to 2.9 lb)
- **Chassis and Tray Material and Finish**: 060 aluminum with powder-coat black finish
- **Tray Components**: 94 V0 PC/ABS black plastic

1.5.2 Environment

- **Ambient Temperature**: -5°C to 55°C (23°F to 131°F)
- **Relative Humidity**: 0% to 90% and noncondensing

1.5.3 Mounting

Three sets of mounting brackets are included for 485 mm (19-in.) racks with ETSI, EIA, and WECO spacing.

1.5.4 Cable Compatibility

- 250 µm OSP
- 900 µm IFC
- 1.75 mm, 2 mm, and 3 mm patch cords and jumpers (Simplex or Duplex)

1.5.5 Adapter Choices

12 or 24 adapter terminations per tray. Add-on kits for 12-port trays available.

- SC/UPC and APC
- LC/UPC and APC
- E2000/UPC and APC
- FC/UPC
- ST/UPC (Splice/Patch Trays only)

1.5.6 Optical Protections

- **Bend Radius**: >30 mm throughout for all cable routing
- **Eye Protection**: No line-of-sight laser exposure. All adapters have factory-installed “dust” covers.

1.5.7 Optical Performance

E-Series Trays will not influence signal timing or jitter.

1.5.8 Compliance

Designed and built to meet ETSI standards.

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Chapter 2: Chassis Installation

ALERT

ALERT! Only qualified personnel may install and maintain this product.

ALERT

ALERT! These instructions presume you have verified that the Telect equipment being installed is compatible with the rest of the system, including power, ground, circuit protection, signal characteristics, equipment from other vendors, and local codes or ordinances.

NOTES:

- Telect is not liable for shipping damage. If the equipment is damaged, notify the carrier and call Telect's Customer Service Department at 1.509.926.6000.
- Chassis are available with or without trays. Telect recommends installing empty chassis on the rack before adding trays in Section 3.

1. Install the rack mounting brackets, as shown on the right.
2. Match rack bracket mounting holes to the rack flange holes. (Two mounting fasteners are required per side.)

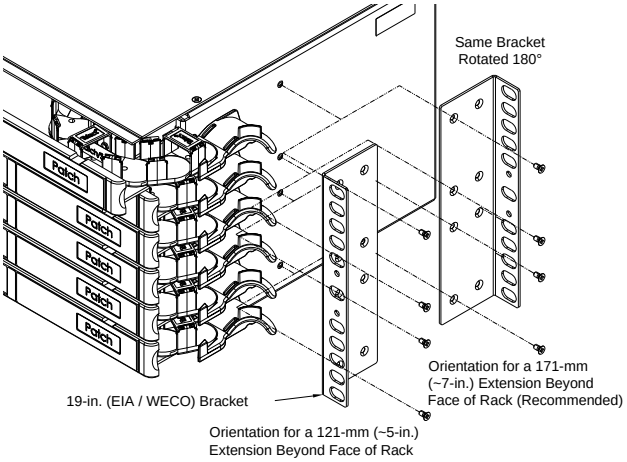
Same Bracket Rotated 180°
Patch
19-in. (EIA / WECO) Bracket
Orientation for a 171-mm (~7-in.) Extension Beyond Face of Rack (Recommended)
Orientation for a 121-mm (~5-in.) Extension Beyond Face of Rack

Figure 21 - Installing Brackets

If a rack bracket hole is completely obscured by an entry/exit arc, Telect recommends disconnecting the linkage near that arc and then temporarily removing the arc, as follows:

a. Open the corresponding tray to access the first couple of links near the arc.

b. Use a pen or a drift pin (less than 3 mm (~.125 in.) in diameter), insert the point through the hole under the selected link, and gently push up while pulling the links apart. See Figures 22 and 23.

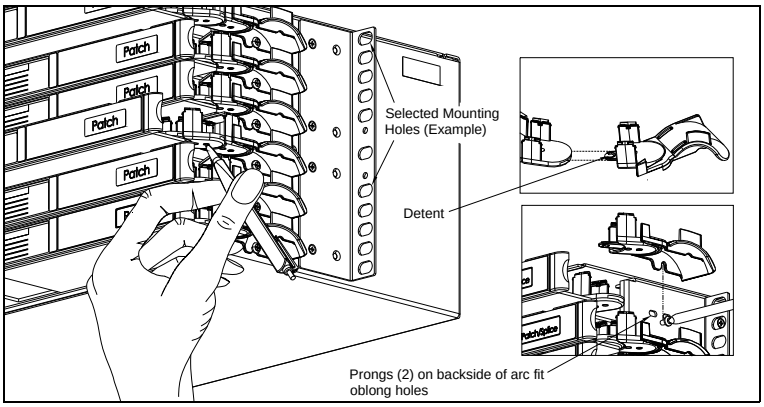

Figure 22 - Disconnecting Linkage Using a Pen Point

The tray removal tool (listed in “Accessories” on page 43), featured in Section 3 for removing trays, has a boss on one end to do this same task.

c. Use a screwdriver to loosen the screw securing the entry/exit arc to the chassis.

d. Lift off the arc and connected links.

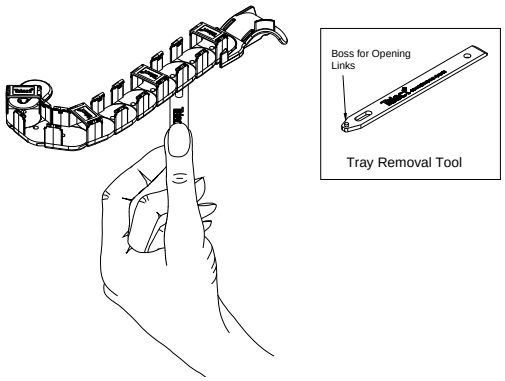

Figure 23 - Disconnecting Linkage Using Tray Removal Tool

3. Install chassis on rack using four fasteners provided, as shown on the right.
4. If applicable, after mounting chassis, re-install arc(s).

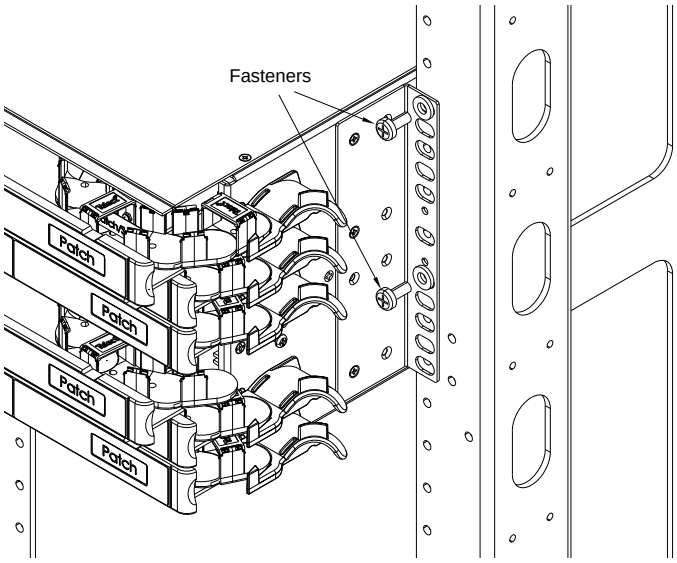

Figure 24 - Mounting Chassis to Rack

Chapter 3: Tray Installation

ALERT

ALERT! Only qualified personnel may install and maintain this product.

ALERT

ALERT! These instructions presume you have verified that the Telect equipment being installed is compatible with the rest of the system, including power, ground, circuit protection, signal characteristics, equipment from other vendors, and local codes or ordinances.

NOTE: Telect is not liable for shipping damage. If equipment is damaged, notify the carrier and call Telect's Customer Service Department at 1.509.926.6000.

Patch trays with factory-installed, connectorized IFC must be installed on-site. For a pre-cable patch tray, place tray and cable at rear of rack and separate tray from container. Pre-cabled panels are mount on a shipping container surrounded by a coil of cable.

Trays include slides that slip into receivers provided in the chassis. After installing a tray, a stop on the receiver and a catch on the slide prevent the tray from being removed. Tray slides and chassis receivers are shown in the following illustration.

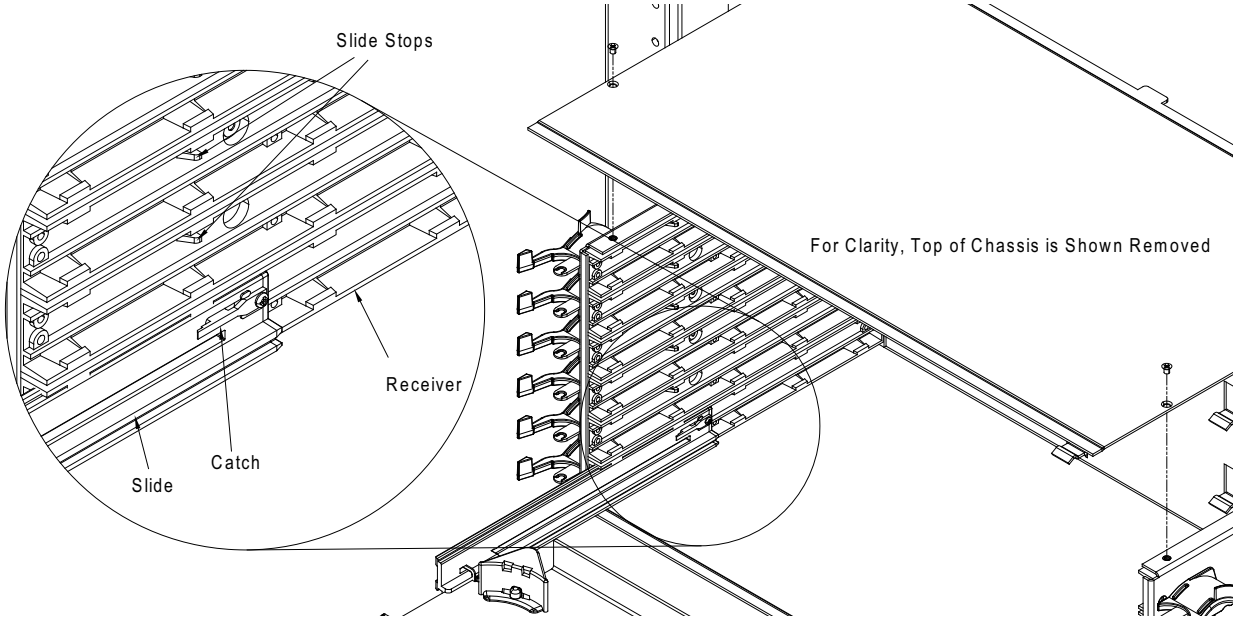

Figure 25 - Installing Trays

If you need to remove a tray, fully extend the tray and then ***gently*** pry open the plastic catch, shown below, about 3 mm (~ .125 in.) or just enough to clear the slide stop on the receiver. (Use only about 3 mm but not more. The catch is easily deformed. If deformed, the catch won't prevent the tray from slipping out of the chassis after re-installation.) If you plan on routinely re-arranging

the chassis trays — before cabling, of course — Telect offers a tray removal tool that makes removal easier. Figure 26 shows the tray removal tool in use.

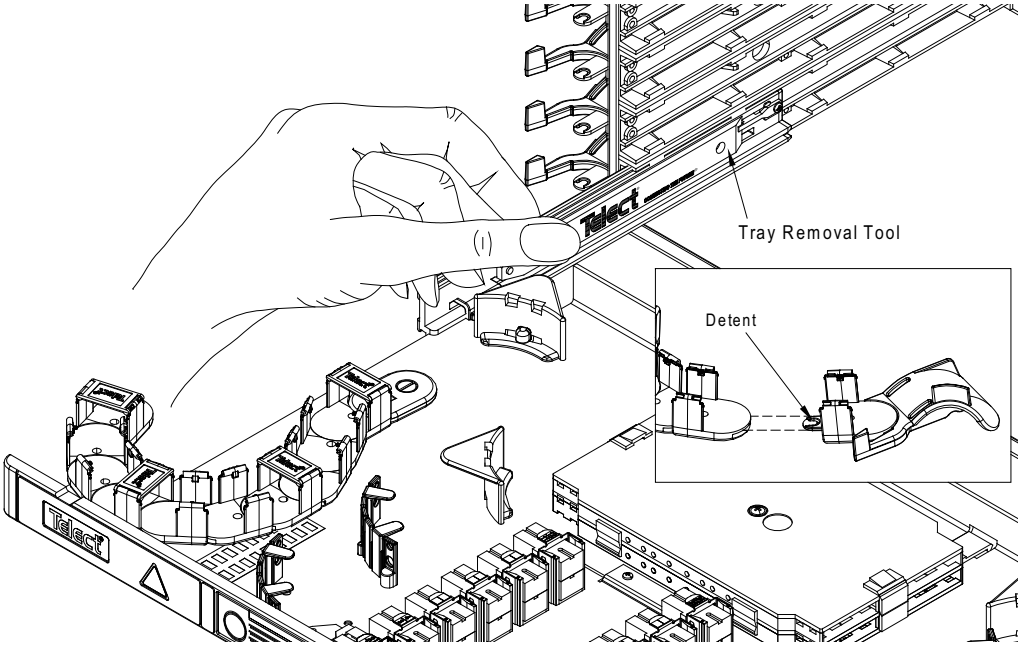

Figure 26 - Using the Tray Removal Tool

To connect the linkage on the tray to the entry/exit arcs, simply slip the lead link over the tang on the arc, as shown in the inset above. A detent prevents the flexible linkage from coming apart.

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Chapter 4: Splice Tray Cabling

ALERT

ALERT! Only qualified personnel may install and maintain this product.

WARNING

WARNING! Fiber cables transmit invisible infrared light. To avoid eye damage or blindness, never look directly into fibers or connectors.

Figure 27 shows an uncabled 24-position splice tray (ESTR-S024-000-000).

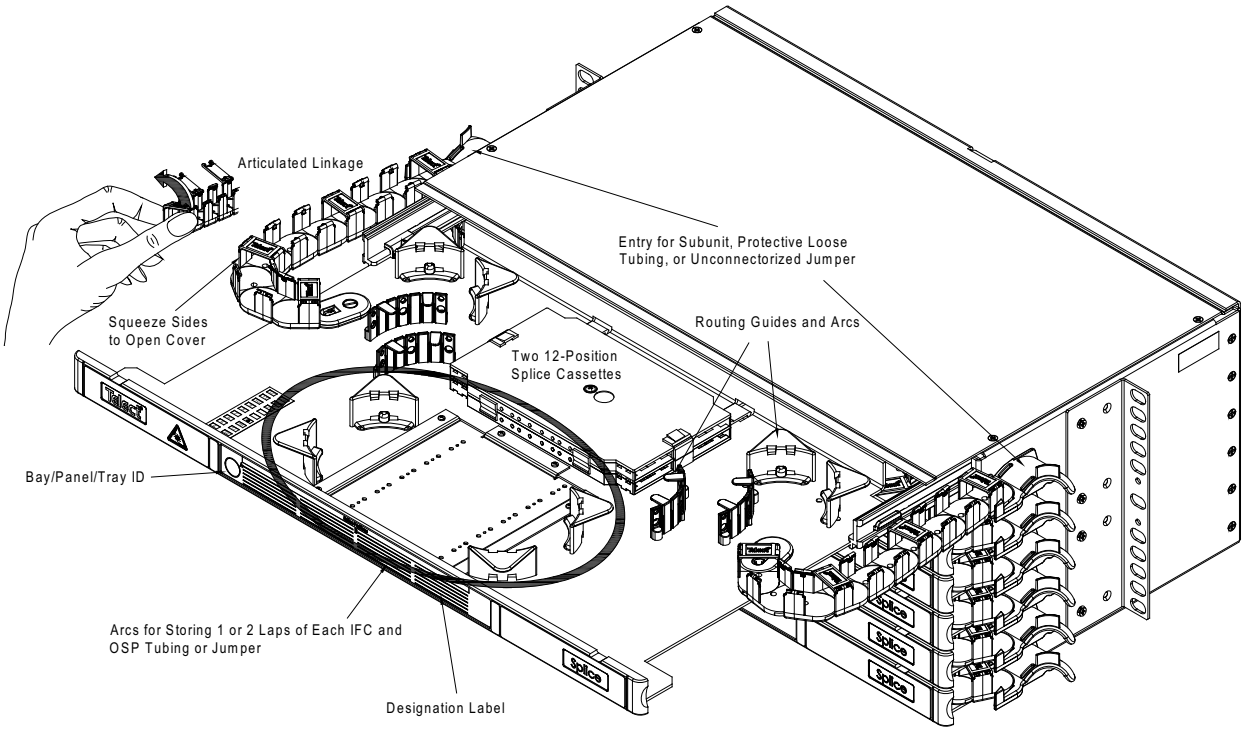
Articulated Linkage
Entry for Subunit, Protective Loose Tubing, or Unconnectorized Jumper
Squeeze Sides to Open Cover
Routing Guides and Arcs
Two 12-Position Splice Cassettes
Bay/Panel/Tray ID
Arcs for Storing 1 or 2 Laps of Each IFC and OSP Tubing or Jumper
Designation Label

Figure 27 - E-Series 24-Position Splice Tray (Model ESTF-S024-000-000)

Please read through this entire procedure before beginning. To install cabling,

1. Assign chassis and trays codes on the designation label.
2. Start cabling in the lowest tray (Tray 1) in the lowest Chassis (Chassis 1) and work upward.
3. Dress multi-fiber cabling.

   The following illustrations contain breakout specifications for Telect's intra-facility cable (IFC) with 900-µm fibers and Telect's dry, flexible indoor/outdoor (I/O) cable with 250-µm fibers. The chassis will accommodate most other types of dry or single-armored multi-fiber cable, with or without a strength member:

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- For IFC, best practice suggests using an IFC Breakout Kit along with bend-control protective loose tubing. (See Section 8, “Accessories.”) The tubing needs to span the distance from the breakout kit, normally anchored with cable ties to the rack, to the cassette(s).

  For robust, large diameter subunits, the feeder cable can be anchored with cable ties directly to the rack, close by the tray’s entry/exit arc. The subunits are routed directly to the cassette entrance(s).

- For I/O cable and other types of outside plant (OSP) cable, use a breakout box along with 3-mm (dia.) bend-control protective tubing. The tubing needs to span the distance between the breakout box, normally bolted to the rack, and the cassette(s). The breakout box also provides an anchor for a strength member and room for a grounding kit.

- For total tray entrance on the left (or on the right)[1], one set of tubes will need to cross over at the storage arcs to reach the other side of the cassette. The cross-over set of cables needs to be dressed about 400 mm (~80 in.) longer than the other set. (An example of a cross-over is shown on Page 9.)

The ends of all subunits and loose tubing will be anchored at the cassette entrance where the strands break out from the tubing.

4. Disassemble the cassette assembly. (Steps continue on page 26.)

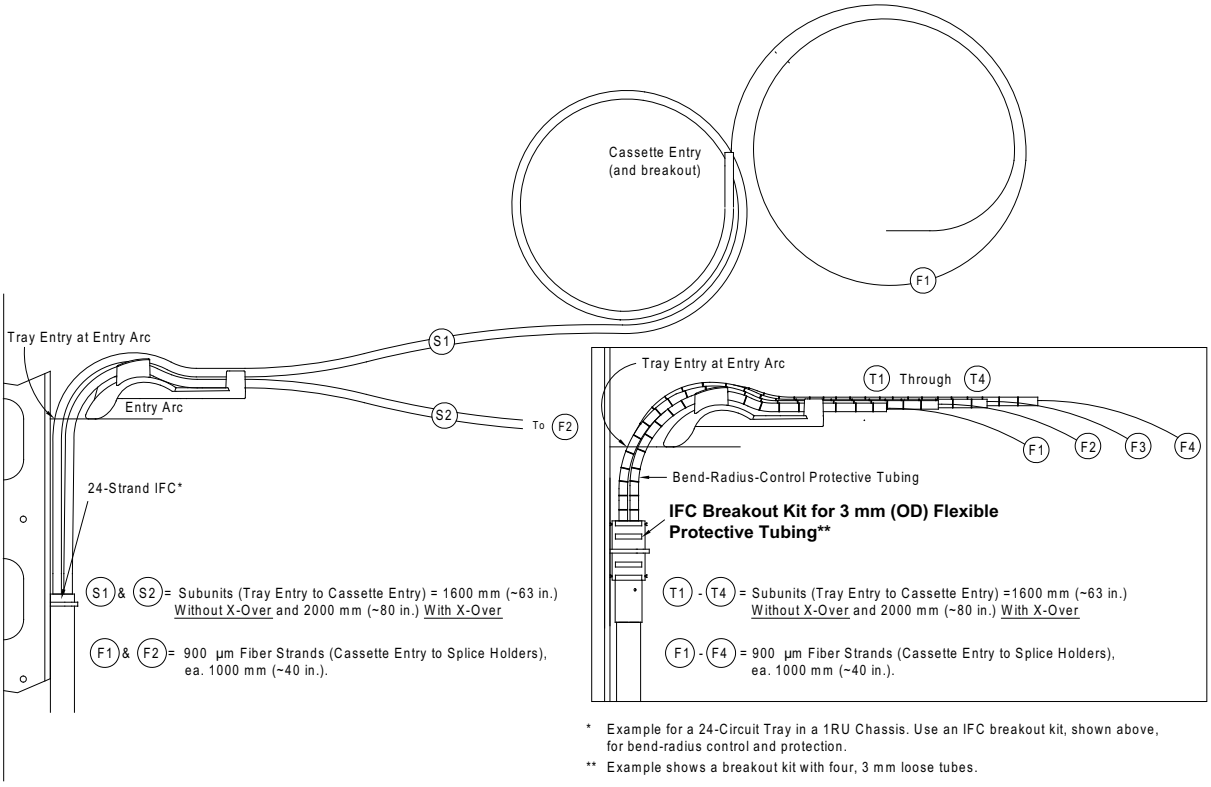
Cassette Entry
(and breakout)
F1
Tray Entry at Entry Arc
S1
Entry Arc
S2
To F2
24-Strand IFC*
S1 & S2 = Subunits (Tray Entry to Cassette Entry) = 1600 mm (~63 in.) Without X-Over and 2000 mm (~80 in.) With X-Over
F1 & F2 = 900 µm Fiber Strands (Cassette Entry to Splice Holders), ea. 1000 mm (~40 in.).
Tray Entry at Entry Arc
T1 Through T4
F1
F2
F3
F4
Bend-Radius-Control Protective Tubing
IFC Breakout Kit for 3 mm (OD) Flexible Protective Tubing**
T1 - T4 = Subunits (Tray Entry to Cassette Entry) =1600 mm (~63 in.) Without X-Over and 2000 mm (~80 in.) With X-Over
F1 - F4 = 900 µm Fiber Strands (Cassette Entry to Splice Holders), ea. 1000 mm (~40 in.).
* Example for a 24-Circuit Tray in a 1RU Chassis. Use an IFC breakout kit, shown above, for bend-radius control and protection.
** Example shows a breakout kit with four, 3 mm loose tubes.

Figure 28 - IFC Breakout Specifications

1. 12-place splice trays only.

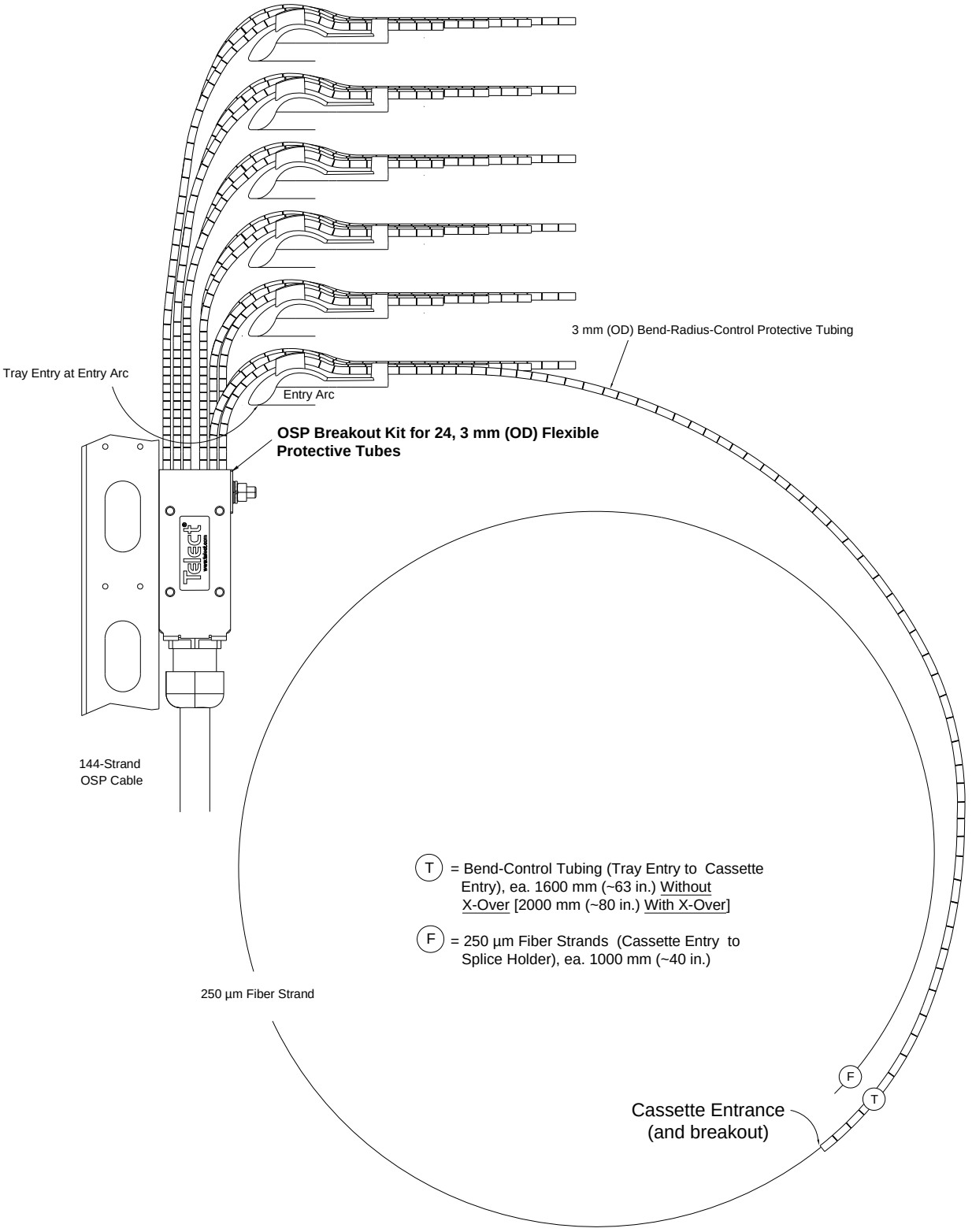
3 mm (OD) Bend-Radius-Control Protective Tubing
Tray Entry at Entry Arc
Entry Arc
OSP Breakout Kit for 24, 3 mm (OD) Flexible Protective Tubes
144-Strand OSP Cable
T = Bend-Control Tubing (Tray Entry to Cassette Entry), ea. 1600 mm (~63 in.) Without X-Over [2000 mm (~80 in.) With X-Over]
F = 250 µm Fiber Strands (Cassette Entry to Splice Holder), ea. 1000 mm (~40 in.)
250 µm Fiber Strand
F
T
Cassette Entrance (and breakout)

Figure 29 - I/O Cable Breakout Specifications

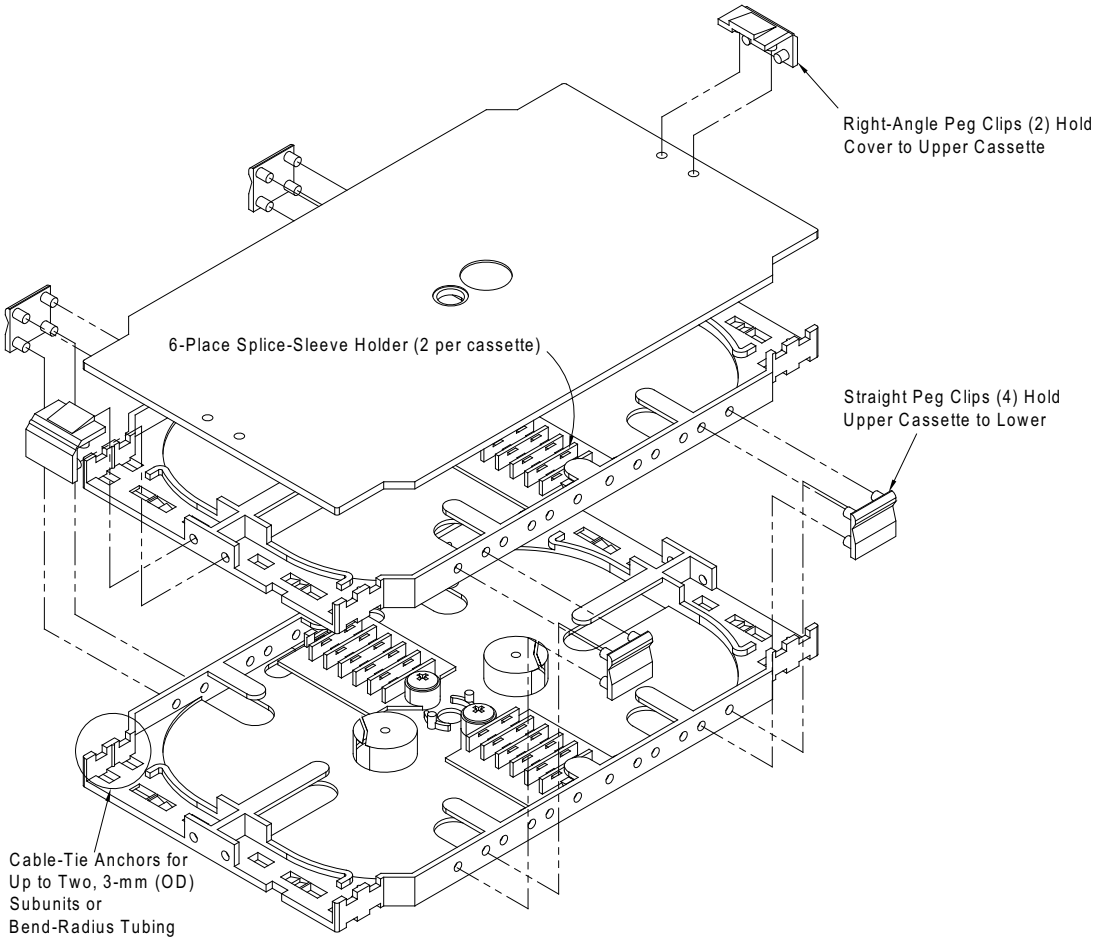
Right-Angle Peg Clips (2) Hold
Cover to Upper Cassette
6-Place Splice-Sleeve Holder (2 per cassette)
Straight Peg Clips (4) Hold
Upper Cassette to Lower
Cable-Tie Anchors for
Up to Two, 3-mm (OD)
Subunits or
Bend-Radius Tubing

Figure 30 - Cassette Assembly (Exploded)

5. Start with the bottom cassette (if applicable):

   a. Slip on the first splice sleeve, dress, and clean the ends of first fiber pair. Splice pair and insert sleeve into splice holder, as shown in Figure 31.

   b. Continue with the next pair.

      The following illustration shows the first splice. In this example, notice that the fiber at the right side of the top 6-position splice holder and the fiber at the left of the bottom holder will be routed counter-clockwise in the cassette. Conversely, the top-left and bottom-right fibers will be routed clockwise. In the example shown,

      – IFC subunits enter the tray from the left and are anchored by two cable ties to the right side of the cassette.

      – OSP fiber strands in bend-control, protective loose tubing enter the tray on the right and are anchored by cable ties to the left side of the cassette.

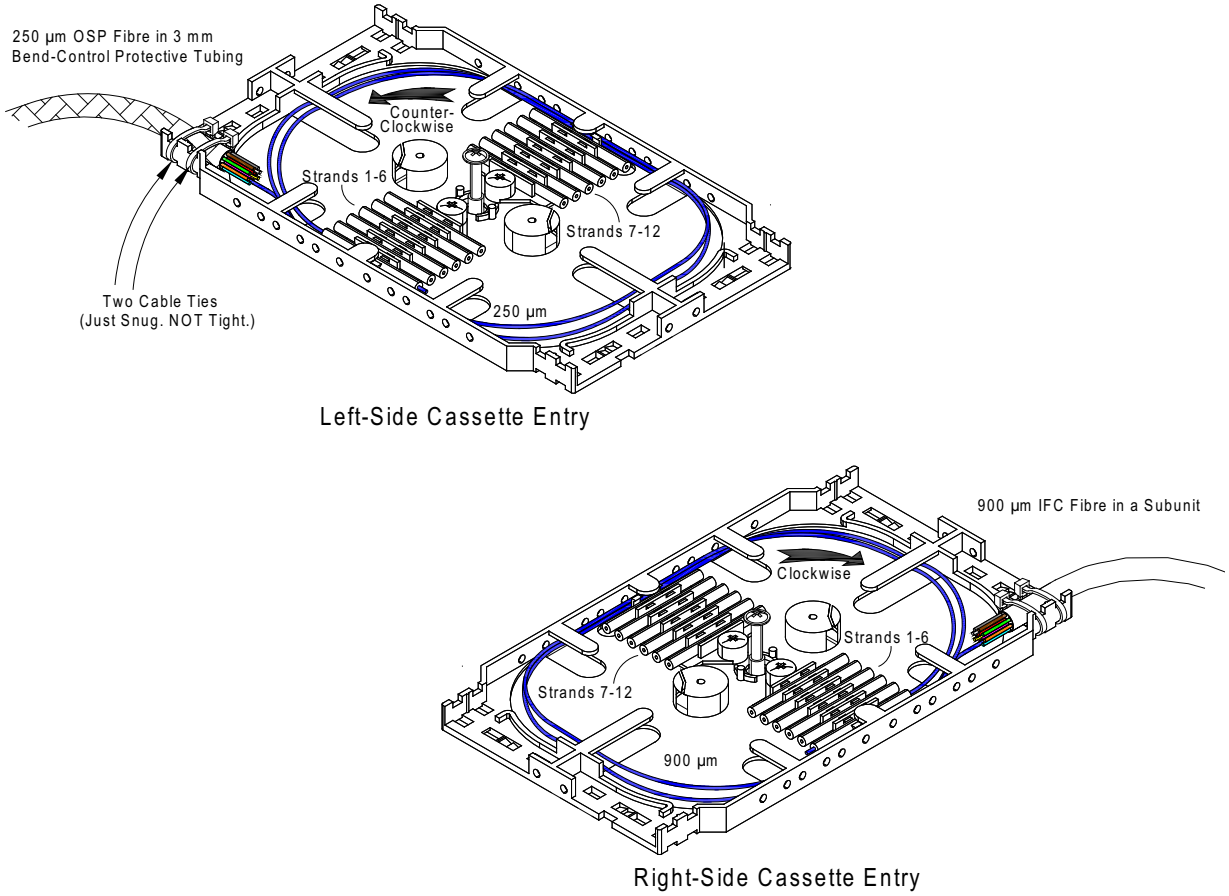

Figure 31 - Clockwise Vs Counter-Clockwise Routing in a Cassette

c. When finished with the cassette, bundle all fiber strands for counter-clockwise routing — OSP strands in this example — and wrap at least twice around the inside of the cassette. Similarly, do the clockwise (IFC) fibers.

d. When finished with bottom cassette of a 24-port panel, use the straight peg clips to fasten the top cassette over the bottom.

6. When finished with the top cassette, use right-angle peg clips to re-install the cover of the cassette assembly.

7. Re-secure the cassette assembly to the tray.

8. Fit lead-in tubing into the linkage and around the four storage arcs adjacent to the cassette assembly: (Start with the tubing that is least likely to require future access — in this case, the OSP loose tubing.) Refer to Figure 32.

   a. Squeeze the sides of the covered links on the right- and left-side linkages to pop open the covers.

   b. Wrap tubes (anchored to the left side of the cassette) twice (counter-clockwise) around the storage arcs, through the right-side linkage, to the right-side tray entrance.

c. Then close the right-side link covers.

d. Repeat for tubing anchored to the right side of the cassette, this time wrapping it clockwise from the cassette to the left-side tray entrance.

9. Make sure all link covers are closed before closing tray. Open and close the tray to check for binding.

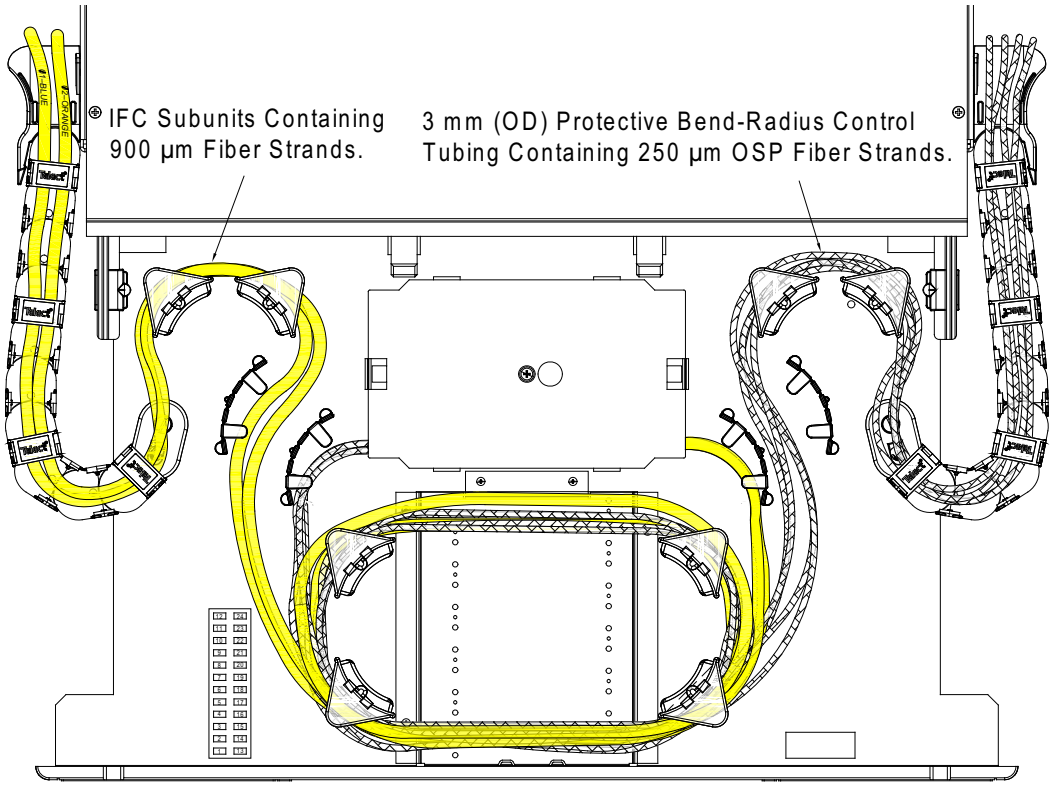
IFC Subunits Containing
900 µm Fiber Strands.
3 mm (OD) Protective Bend-Radius Control
Tubing Containing 250 µm OSP Fiber Strands.

Figure 32 - Example of a 24-Circuit Interconnect Between OSP Fiber Entering on the Right and IFC Fiber Entering on the Left

Chapter 5: Patch Tray Cabling

ALERT

ALERT! Only qualified personnel may install and maintain this product.

WARNING

WARNING! Fiber cables transmit invisible infrared light. To avoid eye damage or blindness, never look directly into fibers or connectors.

Figure 33 shows an uncabled 24-position patch tray (ESTR-P024-USC-000).

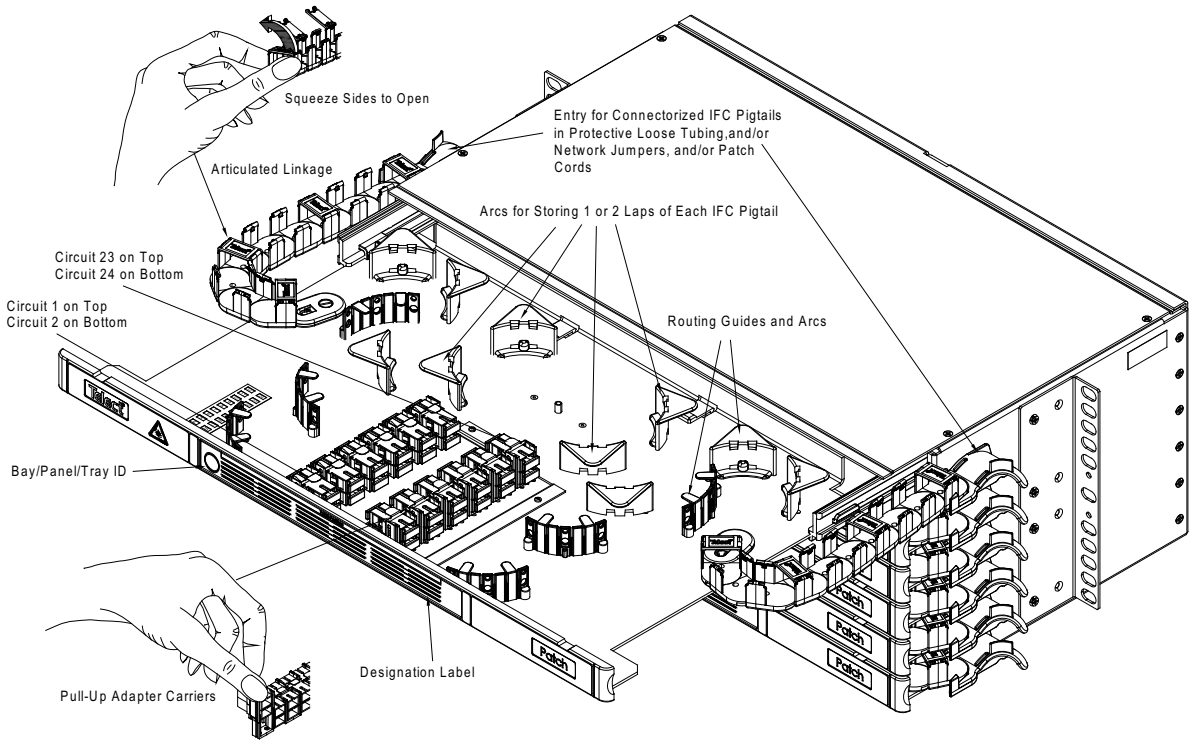
Squeeze Sides to Open
Articulated Linkage
Entry for Connectorized IFC Pigtails in Protective Loose Tubing,and/or Network Jumpers, and/or Patch Cords
Arcs for Storing 1 or 2 Laps of Each IFC Pigtail
Circuit 23 on Top
Circuit 24 on Bottom
Circuit 1 on Top
Circuit 2 on Bottom
Routing Guides and Arcs
Bay/Panel/Tray ID
Designation Label
Pull-Up Adapter Carriers
Patch

Figure 33 - E-Series 24-Position Patch Tray (Model ESTF-P024-000)

Please read through this entire installation procedure before beginning. To install cabling,

1. Assign chassis and trays codes on the designation label.
2. Start cabling in the lowest tray (Tray 1) in the lowest Chassis (Chassis 1) and work upward.
3. For patch trays with factory-installed IFC, go to Step 5.
4. For non-factory-installed, connectorized IFC, refer to the following breakout specifications,

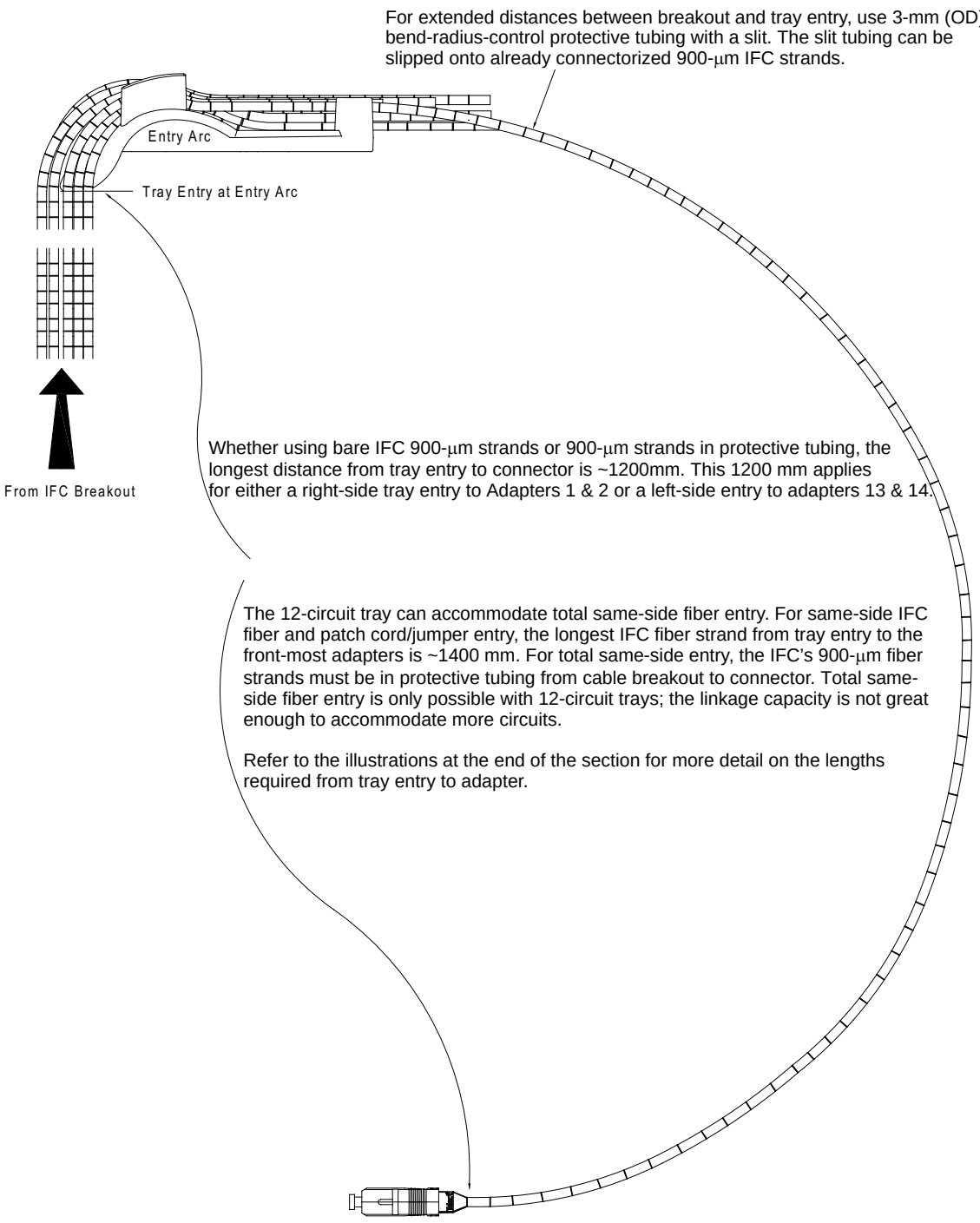
For extended distances between breakout and tray entry, use 3-mm (OD) bend-radius-control protective tubing with a slit. The slit tubing can be slipped onto already connectorized 900-µm IFC strands.
Entry Arc
Tray Entry at Entry Arc
From IFC Breakout
Whether using bare IFC 900-µm strands or 900-µm strands in protective tubing, the longest distance from tray entry to connector is ~1200mm. This 1200 mm applies for either a right-side tray entry to Adapters 1 & 2 or a left-side entry to adapters 13 & 14.
The 12-circuit tray can accommodate total same-side fiber entry. For same-side IFC fiber and patch cord/jumper entry, the longest IFC fiber strand from tray entry to the front-most adapters is ~1400 mm. For total same-side entry, the IFC's 900-µm fiber strands must be in protective tubing from cable breakout to connector. Total same-side fiber entry is only possible with 12-circuit trays; the linkage capacity is not great enough to accommodate more circuits.
Refer to the illustrations at the end of the section for more detail on the lengths required from tray entry to adapter.

Figure 34 - IFC Multi-fiber Breakout Specifications

5. Start with Adapter 2[1] — the bottom adapter on the bottom-left carrier. Raise the carrier and remove the bottom adapter dust cover.

    1. It's easiest to connect the bottom connector on the carrier before the top.

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You can choose to begin with any of the cable sets (IFC, jumpers, or patch cords). However, if you choose to enter feeder, jumpers, and patch cords at the same tray entrance, Telect recommends starting with the IFC first; in short, start with the connector set that you will least likely access again.

6. Remove the dust cover from the corresponding IFC pigtail, jumper, or patch cord. Inspect the polish for dirt. If necessary, see “7.3.1 Cleaning Connectors & Adapters” on page 41 to clean the connector and/or adapter.
7. Connect the pigtail, jumper, or patch cord.
8. Record circuit assignments on designation label.
9. Repeat with Adapter 1 and Connector 1. Then lower that carrier and continue with the next.
10. After a cable set is finished, squeeze the sides of the covered links on the right- and left-side linkages to pop open the covers.
11. Route the fiber, as shown in Figures 35 and 36.

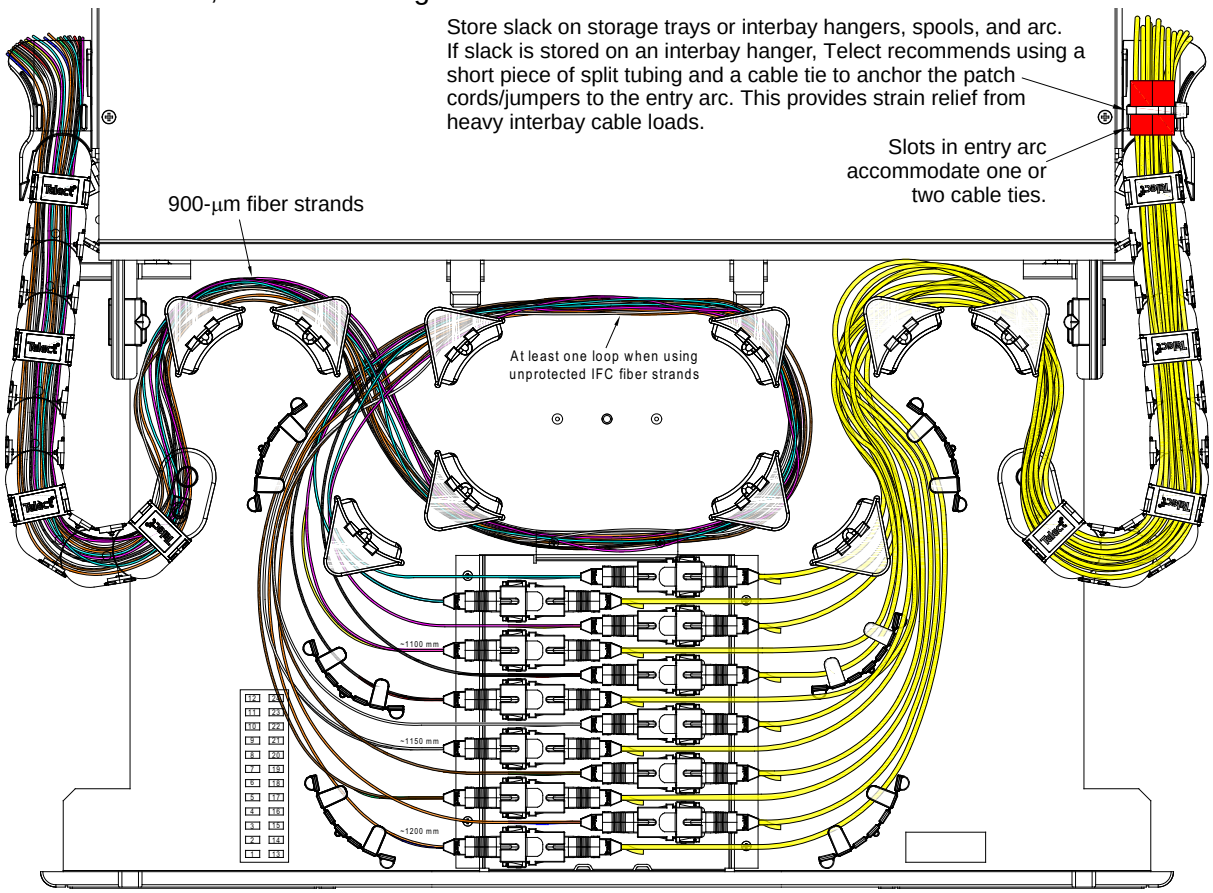
Store slack on storage trays or interbay hangers, spools, and arc. If slack is stored on an interbay hanger, Telect recommends using a short piece of split tubing and a cable tie to anchor the patch cords/jumpers to the entry arc. This provides strain relief from heavy interbay cable loads.
Slots in entry arc accommodate one or two cable ties.
900-µm fiber strands
At least one loop when using unprotected IFC fiber strands
~1100 mm
~1150 mm
~1200 mm

Figure 35 - ESTF-P024-USC-000 with IFC Multi-fiber on the Left & Jumpers on the Right

The storage arcs adjacent to the adapter field are intended mainly for slack storage of fiber strands, subunits, and loose tubing from the IFC. Slack storage of jumpers and patch cords

should be done in an E-Series Storage Tray or on an interbay storage rack with hangers and spools.

12. Close the link covers for that cable set.
13. When finished with all cabling, use a piece of split tubing and one or two cable ties to anchor the patch cords or jumpers to the entry/exit arc. This provides strain relief from heavy interbay cable loads
14. Make sure all link covers are closed before closing the tray. Open and close the tray to check for binding.

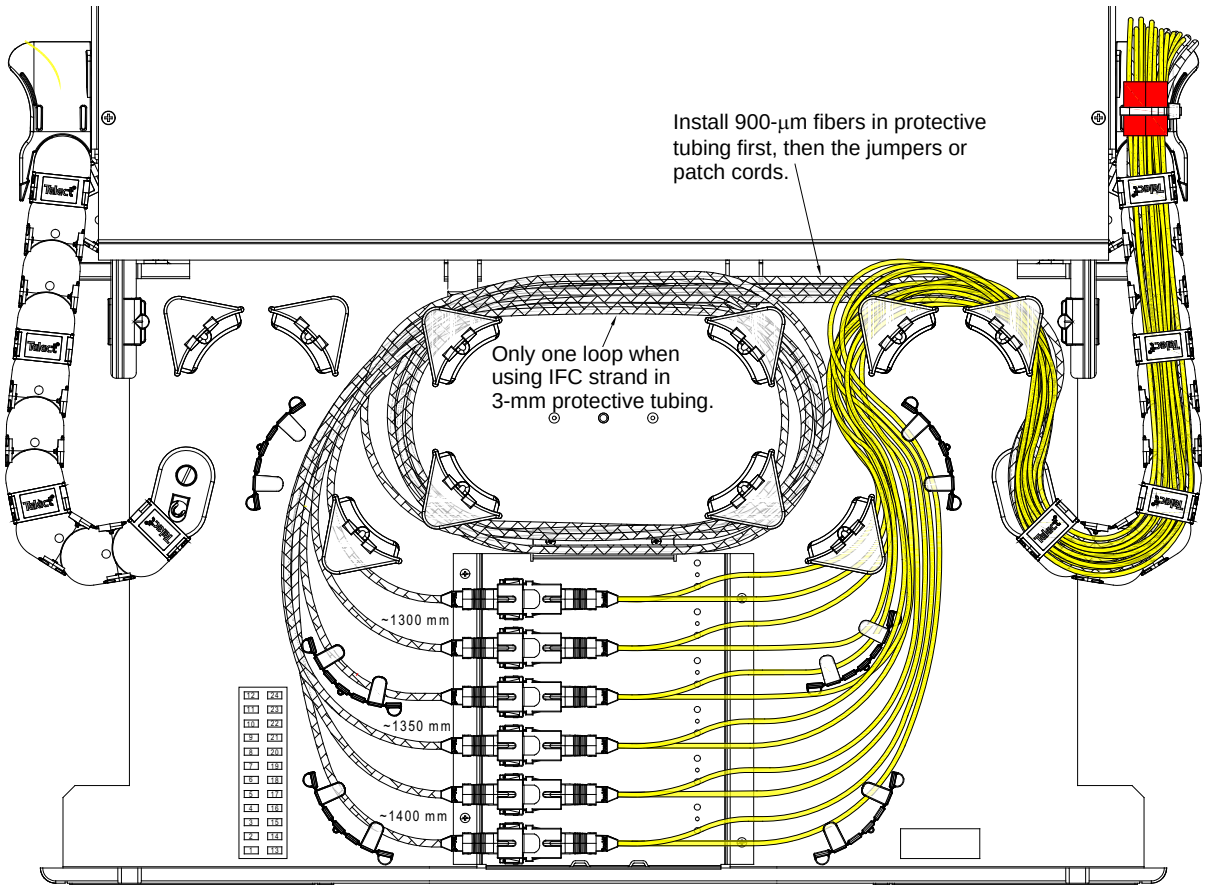
Install 900-µm fibers in protective tubing first, then the jumpers or patch cords.
Only one loop when using IFC strand in 3-mm protective tubing.
~1300 mm
~1350 mm
~1400 mm

Figure 36 - ESTF-P012-USC-000 With Same-Side Entry on the Right

Chapter 6: Splice-Patch Tray Cabling

ALERT

ALERT! Only qualified personnel may install and maintain this product.

WARNING

WARNING! Fiber cables transmit invisible infrared light. To avoid eye damage or blindness, never look directly into fibers or connectors.

Figure 37 shows an uncabled 24-position splice/patch tray (ESTR-C024-USC-000). Splice/patch trays can be ordered with connectorized pigtails installed between the adapters and the cassette(s)' splice holders.

Please read through this entire procedure before beginning. To install cabling,

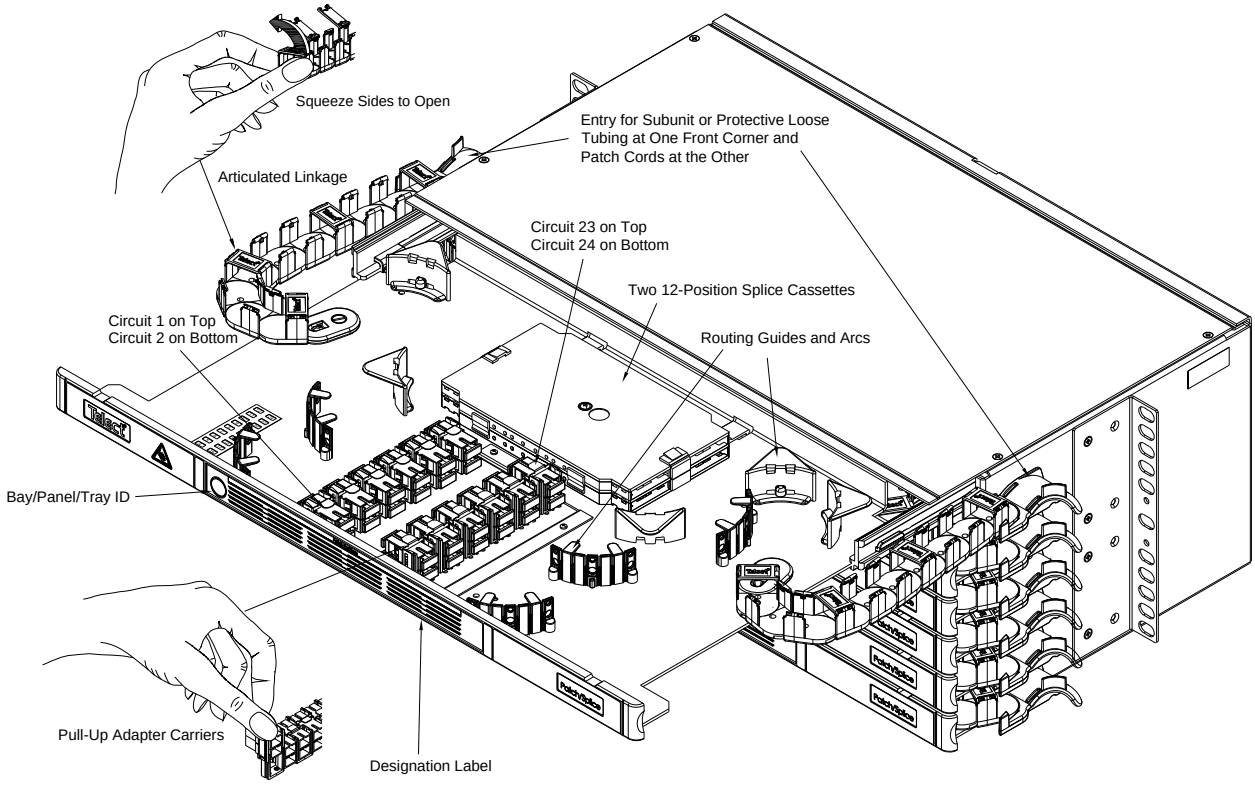
Squeeze Sides to Open
Entry for Subunit or Protective Loose Tubing at One Front Corner and Patch Cords at the Other
Articulated Linkage
Circuit 23 on Top
Circuit 24 on Bottom
Two 12-Position Splice Cassettes
Circuit 1 on Top
Circuit 2 on Bottom
Routing Guides and Arcs
Bay/Panel/Tray ID
Pull-Up Adapter Carriers
Designation Label

Figure 37 - E-Series 24-Position Patch \ Splice Tray (Model ESTF-C024-USC-000)

1. Assign chassis and trays codes on the designation label.
2. Start cabling in the lowest tray (Tray 1) in the lowest Chassis (Chassis 1) and work upward.
3. Dress multi-fiber cabling

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The following illustrations contain breakout specifications for Telect's intra-facility cable (IFC) with 900-µm fibers and Telect's dry, flexible indoor/outdoor (I/O) cable with 250-µm fibers. The chassis will accommodate most other types of dry or single-armored multi-fiber cable, with or without a strength member:

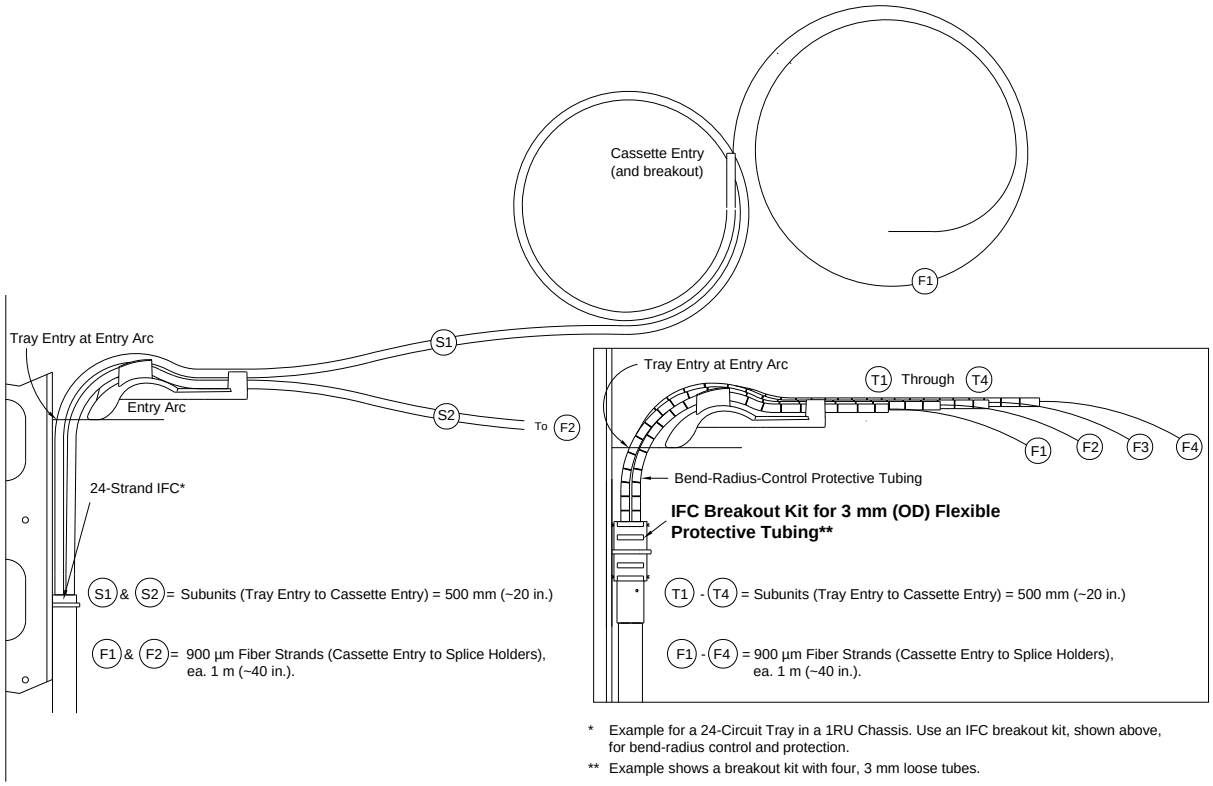
- For IFC, best practice suggests using an IFC Breakout Kit along with bend-control protective loose tubing. (See Section 8, "Accessories.") The tubing needs to span the distance from the breakout kit, normally anchored with cable ties to the rack, to the cassette(s).

  For robust, large diameter subunits, the feeder cable can be anchored with cable ties directly to the rack, close by the tray's entry/exit arc. The subunits are routed to the cassette entrance(s).

- For I/O cable and other types of outside plant (OSP) cable, you must use a Breakout Box along with 3 mm (dia.) bend-control protective tubing. (See Section 8, "Accessories.") The tubing needs to span the distance between the breakout box, normally bolted to the rack, and the cassette(s).

  The breakout box also provides an anchor for a strength member and room for a grounding kit.

The ends of all subunits and loose tubing will be anchored at the cassette entrance where the strands break out from the tubing.


Cassette Entry
(and breakout)
F1
Tray Entry at Entry Arc
S1
S2
To F2
Entry Arc
24-Strand IFC*
S1 & S2 = Subunits (Tray Entry to Cassette Entry) = 500 mm (~20 in.)
F1 & F2 = 900 µm Fiber Strands (Cassette Entry to Splice Holders), ea. 1 m (~40 in.).
Tray Entry at Entry Arc
T1 Through T4
F1
F2
F3
F4
Bend-Radius-Control Protective Tubing
IFC Breakout Kit for 3 mm (OD) Flexible Protective Tubing**
T1 - T4 = Subunits (Tray Entry to Cassette Entry) = 500 mm (~20 in.)
F1 - F4 = 900 µm Fiber Strands (Cassette Entry to Splice Holders), ea. 1 m (~40 in.).

* Example for a 24-Circuit Tray in a 1RU Chassis. Use an IFC breakout kit, shown above, for bend-radius control and protection.

** Example shows a breakout kit with four, 3 mm loose tubes.

Figure 38 - IFC Breakout Specifications

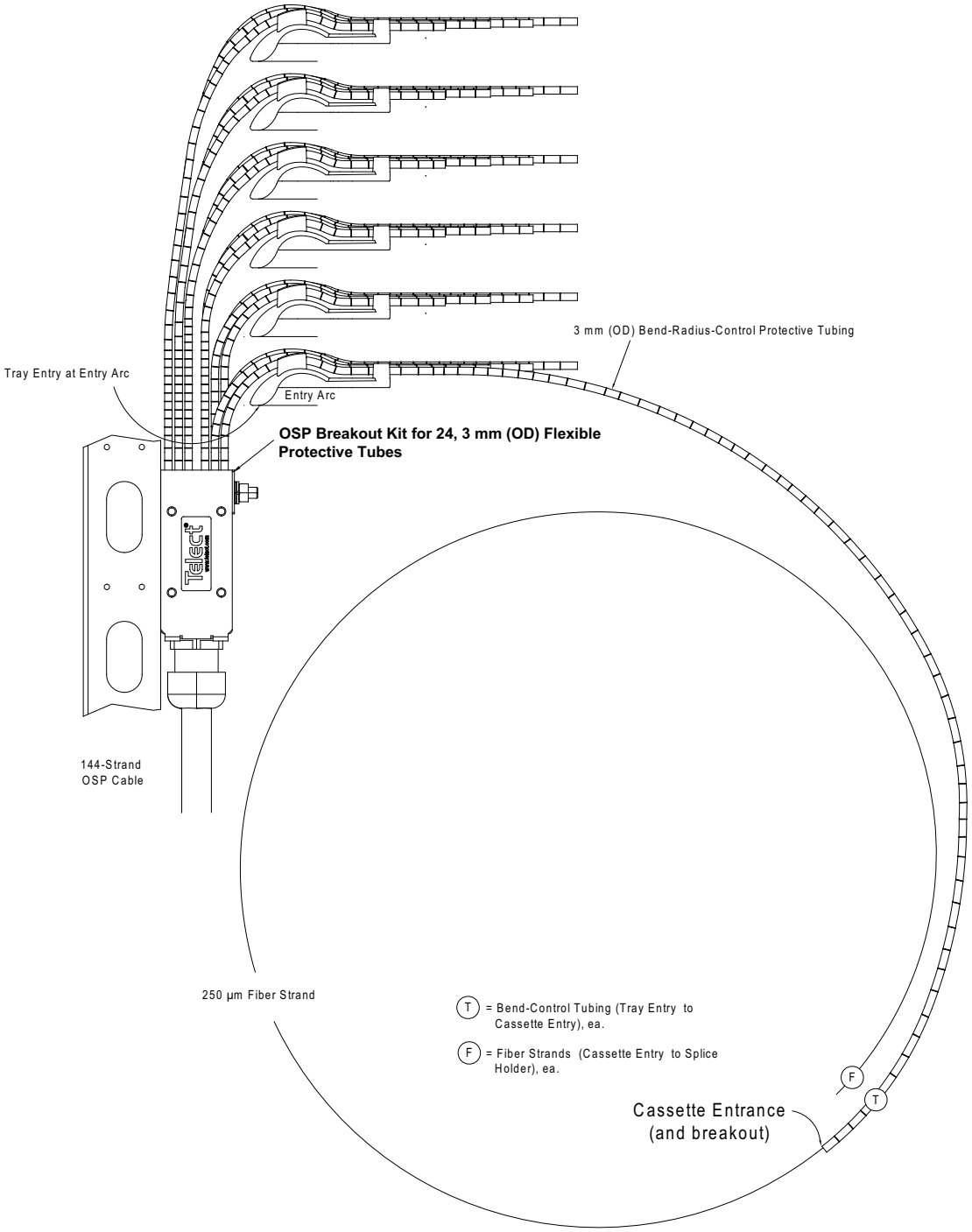

3 mm (OD) Bend-Radius-Control Protective Tubing
Tray Entry at Entry Arc
Entry Arc
OSP Breakout Kit for 24, 3 mm (OD) Flexible Protective Tubes
144-Strand OSP Cable
250 µm Fiber Strand
T = Bend-Control Tubing (Tray Entry to Cassette Entry), ea.
F = Fiber Strands (Cassette Entry to Splice Holder), ea.
F
T
Cassette Entrance (and breakout)

Figure 39 - I/O Cable Breakout Specifications

4. Disassemble the cassette assembly.

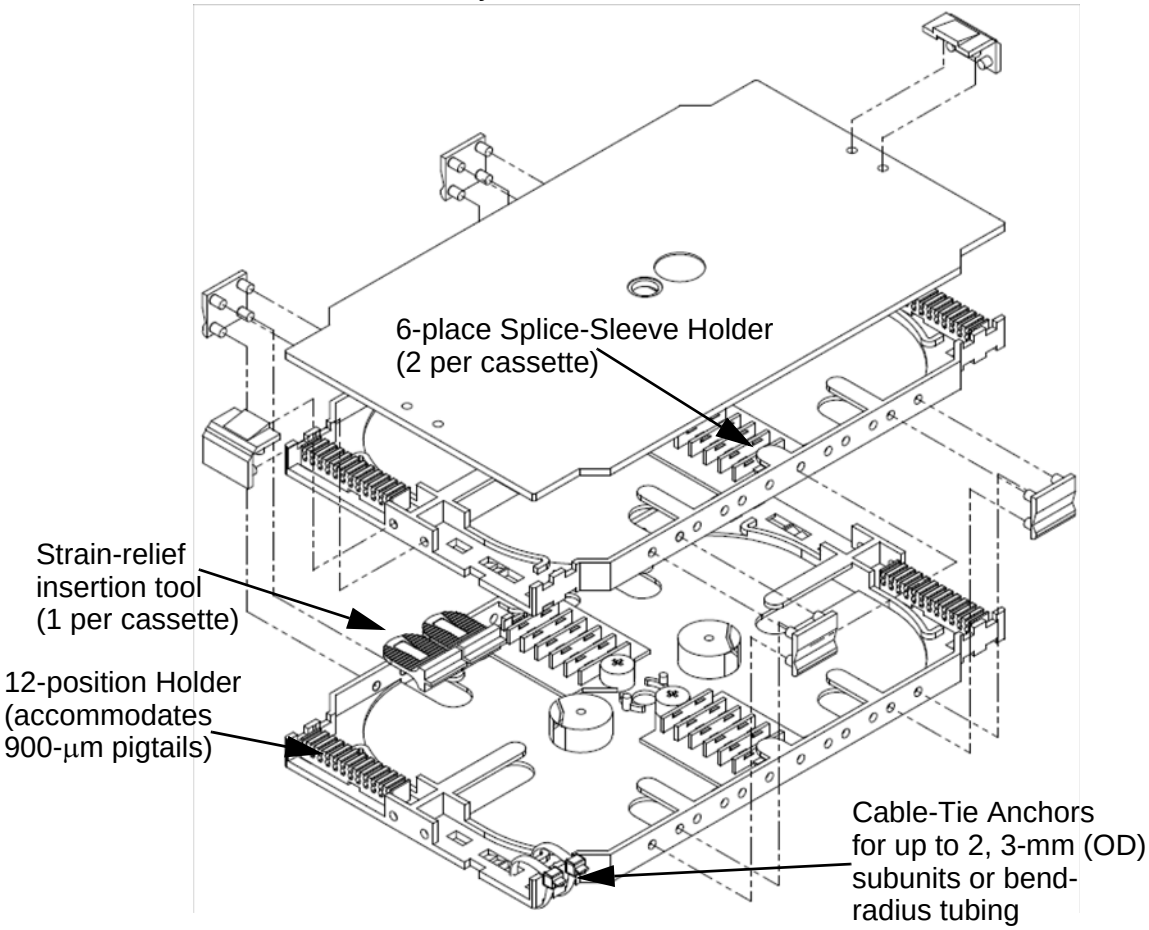


Figure 40 - Cassette Assembly (Exploded)

5. Start with the bottom cassette (if applicable):
   a. Slip on the first splice sleeve, dress, and clean the ends of the first fiber pair.
   b. Splice the pair and insert the sleeve into the splice holder.
   c. Continue with the next pair.

   Figures 41 and 42 show the first splice between the first feeder and first pigtail strands. Notice that the feeder fiber at the top right side of the top 6-position splice holder and the

fiber at the left side of the bottom holder will be routed counter-clockwise in the cassette. Conversely, the top-left and bottom-right pigtail fibers will be routed clockwise.

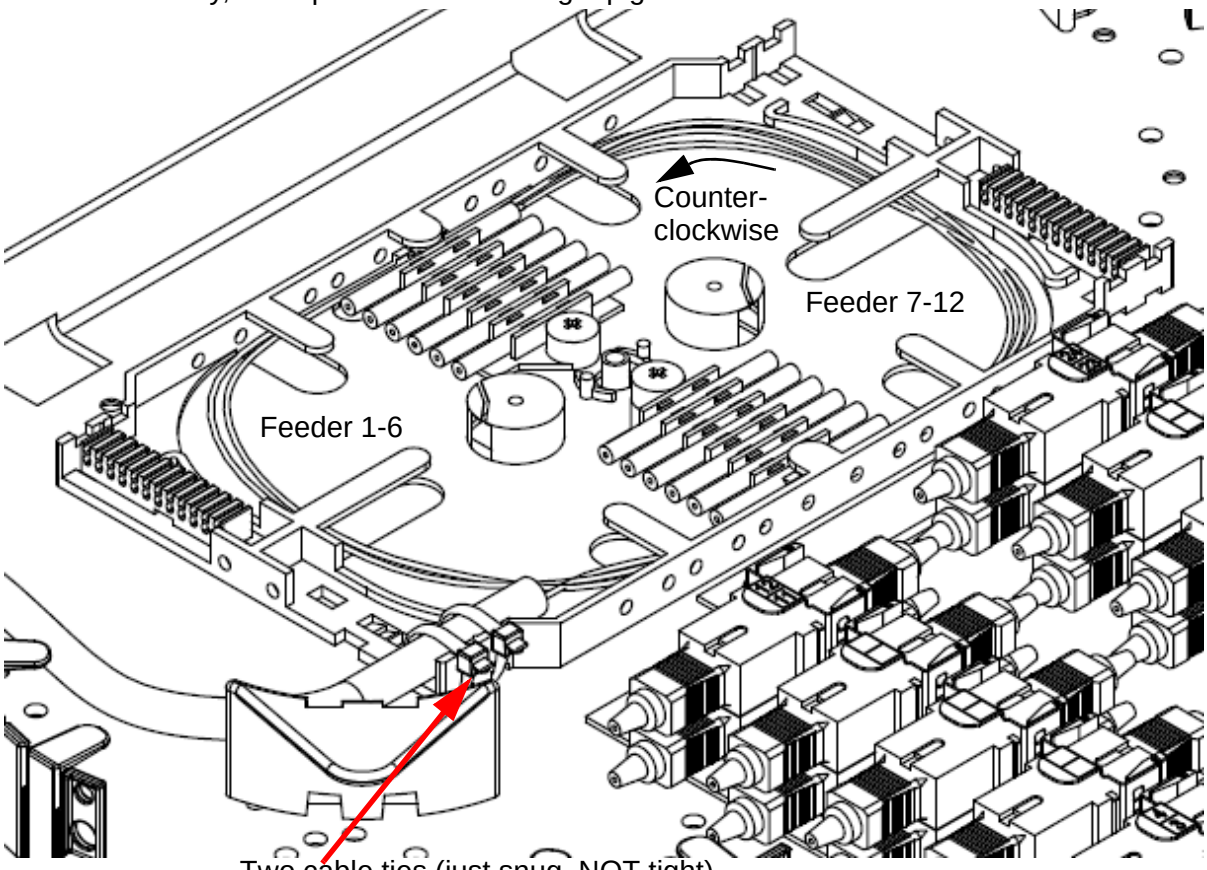


Figure 41 - First Feeder

- IFC subunits or OSP strands in bend-controlled protective loose tubing enter the tray from the left and are anchored by two cable ties to the lower-left entrance of the cassette.
- Connectorized 900-µm pigtails, whether factory installed or constructed on-site, enter the upper-left entrance of the cassette.

d. When finished with the cassette, bundle all fiber strands for counter-clockwise routing — feeder strands in this example — and wrap at least twice around the inside of the cassette. Similarly, do the counter-clockwise (pigtail) fibers.

e. Use two cable ties to anchor the feeder subunit or loose tube to the lower-left entrance of the cassette.

f. Use the strain-relief insertion tool to insert the 900-µm pigtails into the 12-position holder positioned at the upper-left entrance of the cassette.

g. When finished with bottom cassette of a 24-port panel, use the straight peg clips to fasten the top cassette over the bottom.

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6. When finished with the top cassette, use right-angle peg clips to re-install the cover of the cassette assembly.
7. Re-secure the cassette assembly to the tray.
8. Squeeze the sides of the covered links on the right- and left-side linkages to pop open the covers.
9. Fit feeder tubing into the left-side linkage.
10. Close the link covers on the left-side linkage.

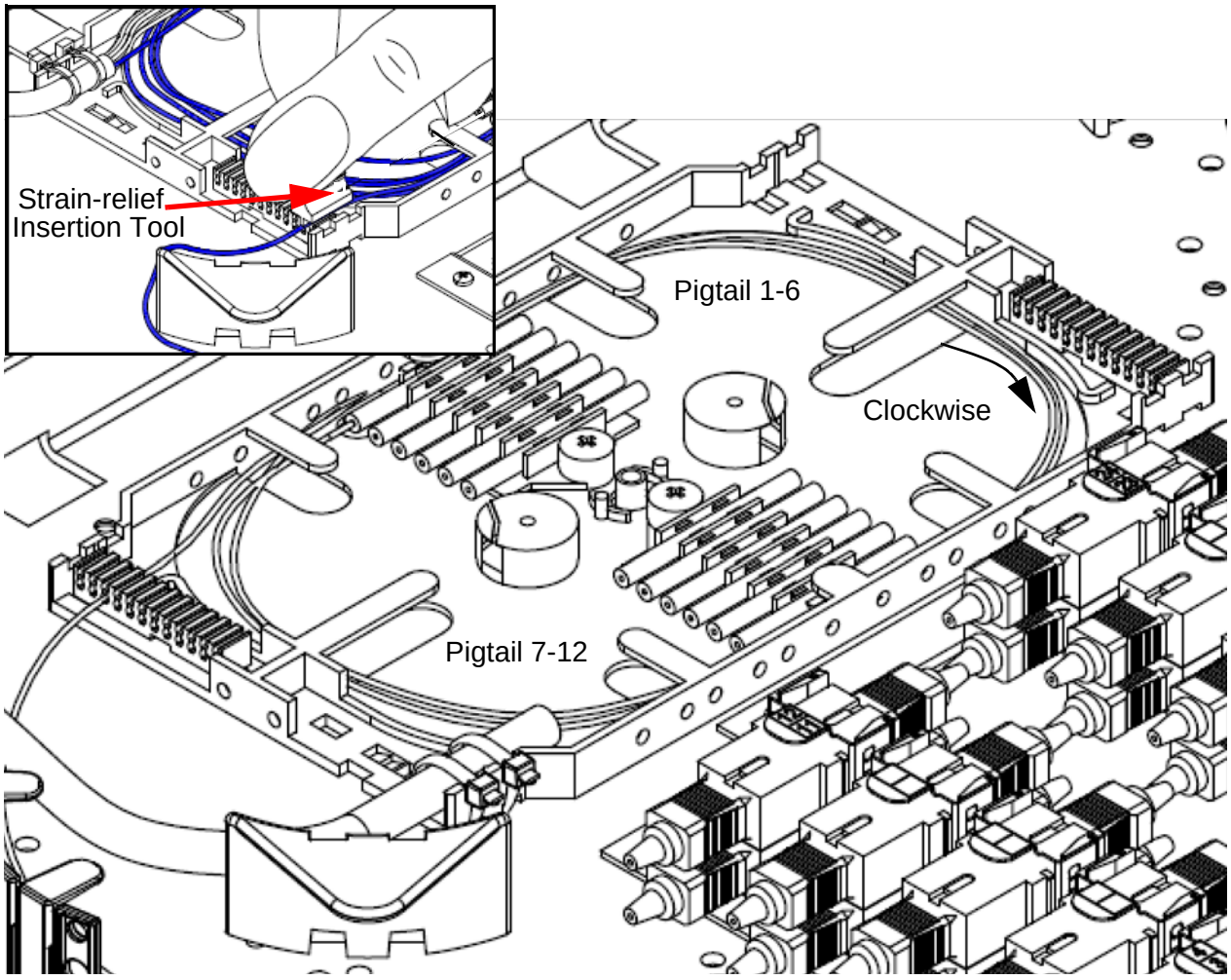

Figure 42 - First Pigtail

11. If they are not factory-installed, connect the pigtail connectors to the left end of the adapters, as follows:
    a. Start with Adapter 2 (It's easiest to connect the bottom connector on the carrier before the top.), the bottom adapter on the bottom-left carrier. Raise the carrier and remove the bottom adapter dust cover.
    b. Remove the dust cover from the corresponding pigtail. Inspect polish for dirt.

If necessary, go to “7.3.1 Cleaning Connectors & Adapters” on page 41for instructions to clean the connector and/or adapter.

c. Connect the pigtail connector.

d. Record feeder assignments on designation label.

e. Repeat with Adapter 1 and Connector 1. Then lower that carrier and continue with the next.

f. Route the fiber, as shown in Figure 43.

12. Repeat Step 11 for the jumpers or patch cords entering the tray on the right.
13. Close the link covers on the right-side linkage.
14. When finished with all cabling, use a piece of split tubing and one or two cable ties to anchor the patch cords and/or jumpers to the entry/exit arc. This provides strain relief from heavy interbay cable loads.
15. Make sure all link covers are closed before closing tray. Open and close the tray to check for binding.

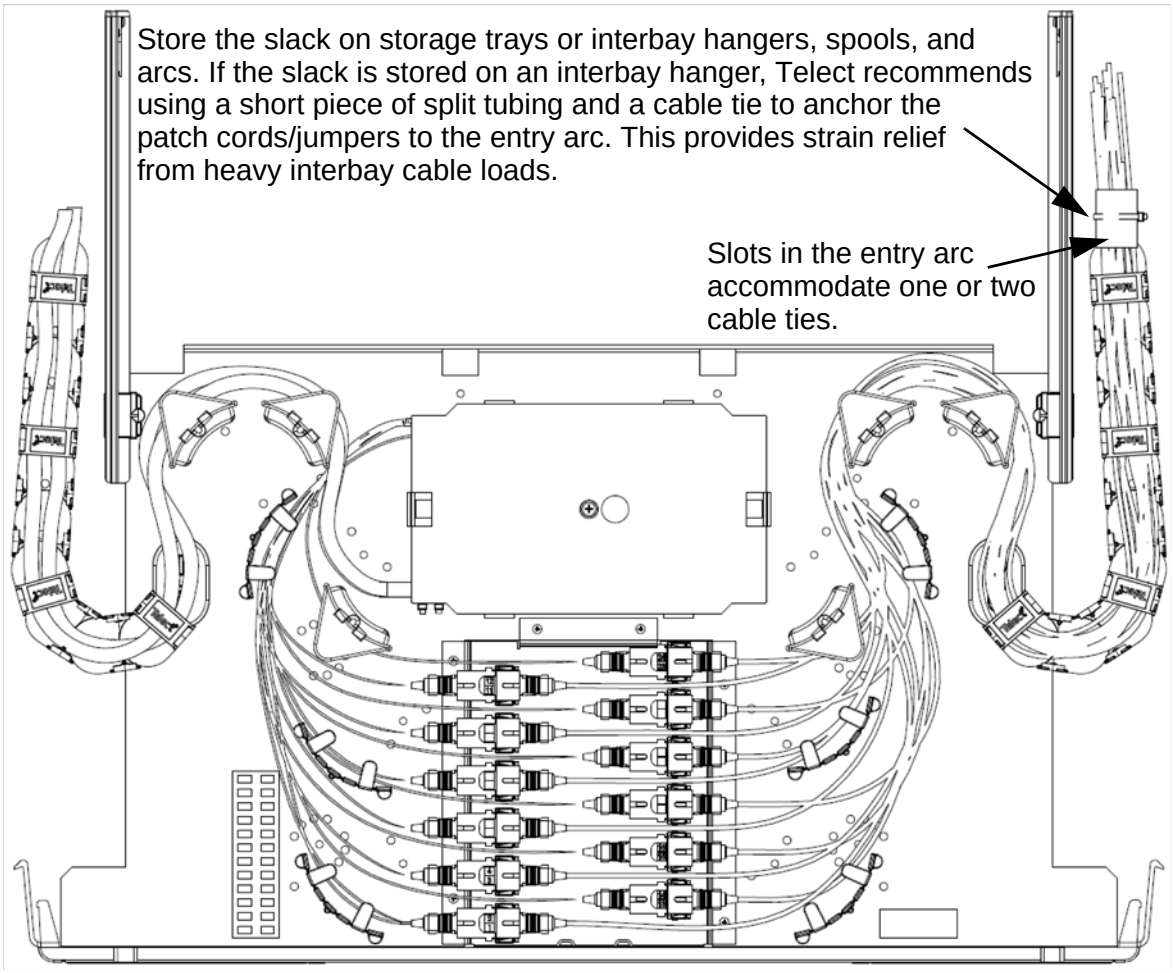
Store the slack on storage trays or interbay hangers, spools, and arcs. If the slack is stored on an interbay hanger, Telect recommends using a short piece of split tubing and a cable tie to anchor the patch cords/jumpers to the entry arc. This provides strain relief from heavy interbay cable loads.
Slots in the entry arc accommodate one or two cable ties.

Figure 43 - Routing the Fiber

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Chapter 7: Service

CAUTION

CAUTION! Only qualified technicians may install and maintain this product.

7.1 In-Warranty Service

Contact Telect's quality call center at 877.471.7245 or e-mail us at quality@telect.com. Telect will ship a new replacement product, along with a return shipping label and authorization information. When you receive your replacement product, pack up the defective product and return it to Telect using the return label, box and any additional information provided.

7.2 Repacking for Shipment

1. Tag the equipment showing owner's name, address, and telephone number, together with a detailed description of the problem.
2. Use the original shipping container if possible. If you do not have it, package the equipment in a way to prevent shipping damage. Include the RMA inside the container and legibly print the RMA number on the outside of the package, near the shipping address.
3. Insure the package. Telect is not liable for shipping damage.

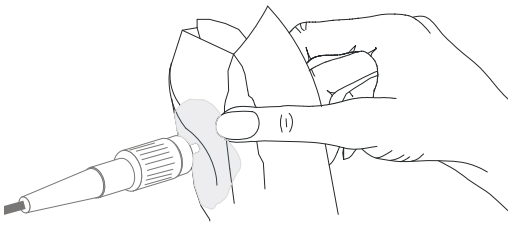
7.3 Maintenance

7.3.1 Cleaning Connectors & Adapters

The major causes for poor performance (high insertion loss) are 1) attenuation due to too sharp or too many close radius bends in the fiber cable, 2) loose connections, and 3) dirty connectors or adapters. If you experience insertion loss greater than 25 dB, check for sharp bends and loose connections. Clean all polished ferrules on pigtail and both ends of the patch cord or jumper.

Though Telect includes dust caps with all adapter and connectors, it isn't always possible to ensure that fiber ferrules stay clean. If you need to clean connectors and adapters, Telect recommends many of the fine systems and solutions available commercially. Special formulation for cleaning fiber faces allows the commercial solvent to stay liquid long enough to dissolve impurities quickly and thoroughly, yet evaporate quickly after wiping dry. Always allow the ferrules to air dry thoroughly before reconnection. You may use "canned air" to clean away debris initially, but don't use an aerosol after cleaning polished surfaces. Most aerosols contain contaminents.

If a commercial solution isn't available, you may use reagent-grade ethyl alcohol, nominally USP ≥ 99%, available at pharmacies:



1. Remove both connectors from the adapter.
2. Blow compressed gas (compressed air or canned compressed gas that is clean, dry, and oil-free) through the adapter.
3. Moisten a lint-free wipe with the ethyl alcohol.
4. Wipe completely around the ferrule of the connector twice. Repeat with a dry wipe.
5. Moisten the center area of a third wipe and pass the face of the ferrule from the moistened area outward toward the dry area. Do twice.
6. Allow ferrule to air dry. Do not wipe the ferrule or allow it to touch anything after completion of this step and before the ferrule is inserted into the adapter. Do not cover with a dust cap.
7. Insert the connector into the adapter.
8. Repeat Steps 2 through 7 for each connector.

7.3.2 Adapter Replacement

NOTES:

- Adapter replacement will interrupt service on working circuits.
- You need to remove the top adapter to access and remove a bottom adapter.
- When inserted in the carrier, the keyways on SC adapters should always be on top.

1. Open the tray.
2. Pull up the adapter carrier.
3. If not marked, mark the connectors for reconnection before removing fiber cables on top and bottom adapters.
4. If necessary, cover the cable connectors with clean dust caps.

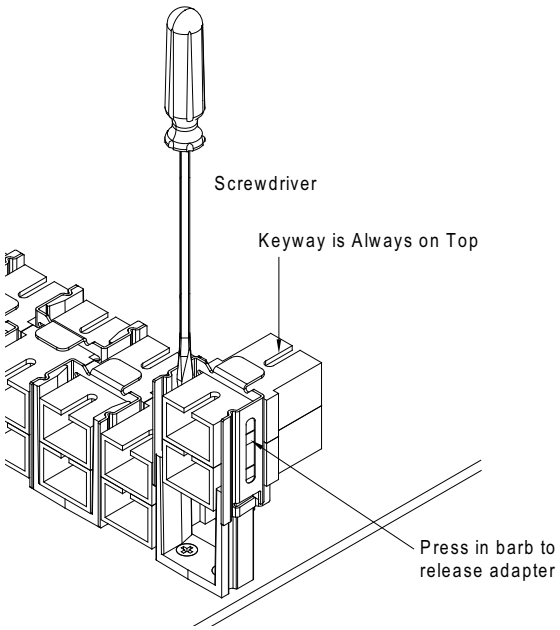


Figure 44 - Replacing SC Adapters

5. See the following illustration and use a small screwdriver to push in the barbs on each side of the top adapter while jockeying the top adapter out of the carrier.

   The adapter and adapter array may be different than the one shown in the illustration.
6. If necessary, repeat for the lower adapter.

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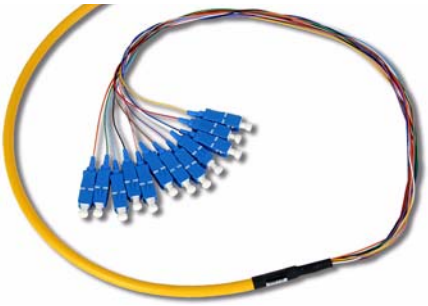
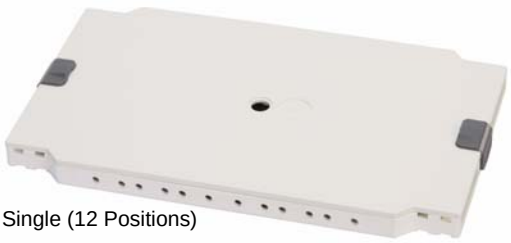
Chapter 8: Accessories

Item	Model	Illustration
Tray Removal Tool	129461	
Pigtail Bundles, 2 m[a]	Contact Telect at +1.509.921.6000	
Fiber Patch Cords	Contact Telect at +1.509.921.6000 or see ***telect.com***	
Multi-fiber Indoor Cable (MIC)	Contact Telect at +1.509.921.6000	
Bend-Control Protective Loose Tubing (5 m Lengths) **5 mm (OD)**	E900-BKBLTS	

Item	Model	Illustration
IFC / OSP, 4-Tube Breakout Kit	E900C-BK4	
OSP, 24-Tube Breakout Kit	E900C-BK24M	
Ground Bonding Kit for Armored OSP Cable[b]	KIT-BOND	
Splice Sleeves (Pkg of 12)	101521-12	

Item	Model	Illustration
Attenuators (Pkg of 10) **SC** **FC** **ST** **LC**	555-3333-0XX 555-3030-0XX 555-3131-0XX 555-3434-0XX where xx is the dissipation in dB - 3dB, 5dB, 10dB, or 15dB (e.g. 555-3333-003 is a package of 10, 3-dB attenuators)	
Cassette Assembly[c]	ESTF-H12	 Single (12 Positions)
	ESTF-H24	 Double (24 Positions)

a. Precabled splice/patch trays include pigtails.
b. Kit contains hardware for OSP armored cable from 0.5 in. (12.7 mm) to 1.6 in. (40.64). Kit also contains an 11 in. (~280 mm), 6 AWG ground wire assembly with single-hole lugs for #10 studs on both ends.
c. E-Series Splice and Splice/Patch Trays include cassette assemblies.

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Appendix A: Fiber Color Code

Pigtail / Position	Color	Color Abbreviation
1	Blue	BL
2	Orange	OR
3	Green	GR
4	Brown	BR
5	Slate	SL
6	White	WH
7	Red	RD
8	Black	BK
9	Yellow	YL
10	Violet	VI
11	Rose	RS
12	Aqua	AQ

Pigtail / Position	Color & Tracer	Color Abbreviation
13	Blue & Black	D/BL
14	Orange & Black	D/OR
15	Green & Black	D/GR
16	Brown & Black	D/BR
17	Slate & Black	D/SL
18	White & Black	D/WH
19	Red & Black	D/RD
20	Black & Black	D/BK
21	Yellow & Black	D/YL
22	Violet & Black	D/VI
23	Rose & Black	D/RS
24	Aqua & Black	D/AQ

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